IMPERIAL MYCOLOGICAL INSTITUTE

REVIEW

OF

APPLIED MYCOLOGY

VOL. XIV APRIL 1935

MEIJER (C.). **Copper sulphate and Sugar Beets.**—*Versl. Landb. Onderzoek. Rijkslandbouwproefstations*, 40A, p. 152, 1934. [Dutch. Abs. in *Facts about Sugar*, xxix, 12, p. 452, 1934.]

Good control of damping-off of young sugar beets [*Pythium de Baryanum* and *Aphanomyces levis*: *R.A.M.*, vi, p. 649] on low-lying clay soils rich in humus [in Holland] has been obtained by the application to the soil of 50 kg. copper sulphate per hect. either before sowing or as a side dressing with sodium nitrate after emergence. Increases up to 44 per cent. in the yield are reported.

QUANJER (H. M.). **Enkele kenmerken der 'vergelings'-ziekte van Suiker- en Voederbieten ter onderscheiding van de 'zwarte houtvaten'-ziekte.** [Some features of the 'yellowing' disease of Sugar and Fodder Beets in contradistinction to the 'black wood vessel' disease.]—*Tijdschr. over Plantenziekten*, xl, 10, pp. 201–214, 2 figs., 1934. [English summary.]

Since 1910 the writer has observed the 'yellowing' disease both of sugar and fodder beets (more especially the latter) [*R.A.M.*, xiii, p. 10] on the most dissimilar types of soil bearing these crops in Holland, and there seems to be no good reason for associating it with any particular soil, constitutional, or geographical feature. The disorder was first reported from the Haarlemmermeer and Spaarndammer 'polders' [land reclaimed from the sea] in 1929 and 1931, respectively. During the period of the writer's observations there has been a noteworthy extension of fodder beet cultivation in Gelderland.

As a result of conversations between the Inspector of Agriculture, the Chief of the Phytopathological Service, and the Director of the Sugar Beet Cultivation Institute in 1929, Hudig's name of 'Zealand disease' was replaced by 'yellowing' [ibid., x, p. 488]. Brandenburg, however [loc. cit.], confused the yellowing of beets with another disorder associated with a *Pythium*. At first he thought this was connected with the reclamation disease but later [ibid., xiii, p. 57] recognized that the latter resulted from copper deficiency. For the disease associated with *Pythium* the name 'black wood vessel disease' is here proposed as descriptive of one of its most prominent symptoms. This

disease is confined to sandy soils and is reported to cause a heavy reduction in the sugar yield.

In yellowing disease the yellowing of the practically full-grown beet leaves generally begins at the leaf tips, extending along the margins and between the larger side veins. At the inception of the disturbance the outer three to eight leaves are still green, the next within these are beginning to turn yellow, while the innermost ones again are of normal appearance. The affected leaves are usually rather shorter, broader, thicker, less flat, and more brittle than healthy ones. As the new leaves expand they also become similarly involved. Towards the latter part of the summer the yellowing leaves, then including the outermost leaves of the plant, develop large necrotic areas on which various black moulds develop.

In the secondary phloem of the diseased leaves a number of the sieve-tubes and companion cells undergo a process that may be termed gummosis. In contrast to the Californian curly top, in which the hypertrophy and hyperplasia of the pericycle and phloem are followed by the exudation of a viscid liquid and by extensive necrosis of the roots [ibid., xiii, pp. 558, 675], the morbid process in yellowing affects only certain groups of sieve-tubes and companion cells. The yellow 'gum' produced in the course of degeneration occupies the entire lumen of each of the affected elements, the walls of which become yellow and sometimes swell, so that the dense contents contract into a small central mass. No exudate is formed, and no abnormality is apparent to the naked eye in root sections. The gummosis extends continuously through the leaf veins and petioles down to the vascular rings of the swollen root ('bulb') and even to the bundles of the root tips and lateral roots; it is absent from the youngest (outermost) vascular rings and also (except possibly in an incipient state) from the youngest lateral roots.

The starch formed during the day in yellowing leaves does not, as in healthy ones, disappear during the night, a period of five successive days with total exclusion of light being required for depleting the starch in September. Once free from starch the affected leaves resume photosynthesis on a limited scale but after three days the accumulation recommences. The removal of starch is normally due to two essential processes, respiration and translocation, and tests showed that the latter process is inhibited in the yellowed leaves. The starch accumulation, therefore, appears to be due to impeded translocation associated with gummosis of the phloem. It has not yet been possible, however, definitely to place the yellowing disease of beets in the group of virus disorders characterized by phloem occlusion and consequent starch accumulation.

KENDRICK (J. B.). **Bacterial blight of Carrot.**—*Journ. Agric. Res.*, xlix, 6, pp. 493–510, 8 figs., 1934.

This is an account of a bacterial disease of carrots commercially grown for seed in the upper delta region of the Sacramento Valley, California, where it was first observed in 1931, causing considerable damage in certain fields. It recurred in a widespread and severe fashion in 1932, presumably owing to favourable weather conditions. The disease is characterized by an irregular necrotic spotting on the leaves

and involucral bracts, dark-brown streaks on the petioles, peduncles, and stems, and a blighting of some or all the flowers in the umbels involving a more or less considerable loss in seed yield. So far the disease has not been observed to cause appreciable damage to carrots grown for the market in California.

Isolations from diseased tissues readily yielded a bacterial organism which is considered to be previously undescribed and is named *Pseudomonas carotae*, with an English technical description. It is an aerobic, non-sporulating, non-capsulate, Gram-negative, cylindrical rod with rounded ends, occurring singly or in pairs, measuring 1·38 to 2·75 by 0·42 to 0·85 μ (average 1·95 by 0·59 μ), and provided with one or two polar flagella. On potato-dextrose agar it forms round, smooth, convex or pulvinate, glistening, straw-yellow to massicot-yellow colonies with entire margins; it liquefies gelatine, does not coagulate milk, does not reduce nitrates, has no diastatic action on starch, does not produce indol, and does not form acid from maltose or rhamnose. In beef extract broth it did not grow at hydrogen-ion concentrations of P_H 5·1 or below, but made fair growth at 5·4 and moderate to strong growth at 5·6 to 6·2. It grows at temperatures ranging from 13° to 30° C., with an optimum between 25° and 30°, and thermal death point at 49°. The organism was found to resist freezing in water, and to be able to withstand 204 hours of drying on glass slides.

While some evidence indicated that soil may be a source of infection, the prevalence of floral infection suggests that the seed from diseased plants is chiefly involved in the distribution of the disease. This view is supported by the fact that from 5 to 7 per cent. of obvious infections were obtained in a fairly extensive test, in which plants were raised from seed that had been dipped in a water suspension of the causal organism. Another test indicated that seed from diseased plants does not carry the organism internally.

Dowson (W. J.). **Phytophthora megasperma Drechsler in Tasmania.**—*Trans. Brit. Mycol. Soc.*, xix, 1, pp. 89–90, 1934.

A very brief account is given of a serious black rot which developed in bagged carrots grown in Tasmania during their transit to Sydney, New South Wales, in April and May, 1931, a season which was abnormally wet in Tasmania. Isolations from diseased carrots yielded a *Phytophthora* identified by S. F. Ashby as *P. megasperma* [*R.A.M.*, xii, p. 466] which under controlled conditions reproduced a slow rot similar to the one occurring in nature when inoculated on slices of young, fresh carrots kept moist at 25° C.; no infection, however, was observed when portions of mature carrots were inoculated and none was obtained through the unwounded surface. The trouble did not recur in 1931–2, when the season was much drier than in the previous year.

Jones (L. K.). **Tobacco mosaic on Spinach.**—Abs. in *Phytopath.*, xxiv, 10, p. 1142, 1934.

Mechanical juice inoculations on Bloomsdale Savoy spinach [? in Washington State] with tobacco mosaic virus No. 1 [*R.A.M.*, xiv, p. 197] gave 50 to 90 per cent. infection after 16 to 20 days' incubation. The first symptom of the disease is a mottling of the older foliage with slightly

raised dark green areas in the paler green tissue. At a more advanced stage the leaves become increasingly puckered and general dwarfing is observed. Yellowing of the older foliage is followed by death a month to six weeks after inoculation.

Tompkins (C. M.) & Gardner (M. W.). **Spotted wilt of head Lettuce.**—Abs. in *Phytopath.*, xxiv, 10, pp. 1135–1136, 1934.

Head lettuce in some of the coastal districts of California is severely affected by tomato spotted wilt [*R.A.M.*, xiv, p. 201], which causes slight marginal wilting, necrotic spotting, and yellowing of the leaves, generally on one side of the plants. Many leaves develop lateral curvature. Infection may take place at any age. All varieties observed, including romaine [cos lettuce], are susceptible to the virus, which has an incubation period of 10 to 25 days. The lettuce virus produced typical spotted wilt in tomato and vice versa, cross-inoculations being also successful with several other known hosts of the virus. Local lesions have been produced on snapdragon [*Antirrhinum majus*] and broad bean [*Vicia faba*] and systemic infection on lettuce by inoculation from Calla lily [*Zantedeschia aethiopica*].

Reusrath (T.). **Die durch den Erreger 'Olpidiaster radicis' in der Gurkenfrühtreiberei hervorgerufene Blattwelke und deren Bekämpfung.** [The leaf wilt of forced Cucumbers caused by *Olpidiaster radicis* and its control.]—*Obst- und Gemüsebau*, lxxx, 10, p. 152, 1934.

During the last three years a sudden wilting of the foliage of forced cucumbers has caused increasingly heavy losses to market-gardeners in the Glückstadt district of Schleswig-Holstein, to which the disease appears to be restricted. Wilting begins between April and June in the basal leaves, whence it spreads to the stems, partially or totally destroying the plants and in any case rendering their yield negligible. The causal organism, *Olpidiaster* [*Asterocystis*] *radicis* [*R.A.M.*, viii, p. 282], may be controlled by the application to the soil in the plant beds of 60 gm. uspulun per cu.m., if necessary supplemented by watering the soil round the plants with a 0·5 per cent. uspulun solution, of which each should receive 2 l., this application being repeated after a week.

Chevalier (A.). **Les maladies et les ennemis de l'Arachide.** [Diseases and pests of the Groundnut.]—*Rev. de Bot. Appliquée et d'Agric. Trop.*, xiv, 156–157, pp. 709–755, 4 pl., 4 figs., 1934.

This paper constitutes the sixth chapter of the author's monograph of the groundnut, and deals at some length with the chief fungal, bacterial, and virus diseases, and insect pests of the crop, which have been so far recorded in literature or personally observed by him. The list of the fungal diseases includes, among others, black spot caused by *Cercospora personata* [*R.A.M.*, xiii, p. 74], which is stated to occur wherever the groundnut is cultivated, and which was also found on several wild species of *Arachis* indigenous in Brazil, namely, *A. glabrata*, *A. marginata*, *A. villosa*, *A. tuberosa*, *A. pusilla*, and *A. rasteiro*, preserved in the Herbarium of the Museum in Paris; rust caused by *Puccinia arachidis* [ibid., xii, p. 246]; root rots due to several species of *Rhizoctonia* or *Corticium*; and foot and root rot caused by *Sclerotium rolfsii*

[ibid., xii, p. 357]. Mature groundnut pods are attacked by moulds and other fungi which may sometimes penetrate deeply into the living tissues. Among the latter, an account is given of an apparently hitherto undescribed fungus which was found forming a whitish mycelial weft on pods grown in Paris, and which is named *Cercosporella cylindrospora* Heim (with a French diagnosis). It is characterized by long cylindrical, subhyaline, 5- to 7-septate conidia, slightly tapering towards the base and rounded at the apex, and measuring 52 to 65 by 10 to 14 μ; they are borne on erect, cylindrical, septate conidiophores, 3·5 to 4 μ in width.

Le Champignon de couche. Sa biologie. Ses ennemis. [The cultivated Mushroom. Its biology. Its enemies.]—vii + 130 pp., 7 pl., Société Le Champion, 27, rue de Dijon, Bordeaux, 1934.

The primary aim of this useful booklet, written in popular language, is to promote the use by commercial growers of the cultivated mushroom (*Psalliota campestris*) of the spawn produced under controlled conditions by the publishers. After a very brief account of the biology of the mushroom, practical advice is given for the proper installation and working of the beds, particularly in disused quarry galleries, such as are commonly used for this purpose in the neighbourhood of Paris [cf. *R.A.M.*, xiv, p. 74]. This is followed by some recommendations for the prevention of the introduction of parasitic diseases into the mushroom-growing premises, and the book terminates with brief accounts of the principal bacterial and fungal troubles and insect pests of the crop in France, the control of which is briefly discussed in each case.

Du Plessis (S. J.). **Botrytis rot of Grapes, and its control during 1933–34.**—*Farming in South Africa*, ix, 103, pp. 395–397, 2 figs., 1934.

An account is given of a series of experiments conducted during 1933–4 in the control of *Botrytis* [*cinerea*], the losses from which among South African grapes in storage and transport are stated to have been immense during recent years [*R.A.M.*, x, p. 703]. The field trials were carried out at Constantia on the highly susceptible Henab Turki variety and to a lesser extent on Red Hanepoot, while the complementary laboratory investigations were made at Stellenbosch.

The experimental grapes were picked as usual, placed in cold storage for three weeks, and then transferred to ordinary room temperature for one or two weeks, after which counts of infection by *Botrytis*, *Penicillium*, and *Rhizopus* were made. In this way a total of 700 boxes was used and nearly half a million grapes individually examined. The vines from which the grapes came were treated only once for the early crop, and where a late crop was obtainable a subsequent dusting or spraying was given. Infection by *Botrytis* was generally slight in the vineyards, and only in three experiments was it possible to determine the relative effects of the various treatments of the incidence of the disease. Copper sulphur dust (capex) proved superior to zinfandelite, sodium sulphite and kaolin, copper-lime dust (springbok), cupric sulphur, cuprite, bouisol [ibid., xiv, p. 200], and sulsol. The best control of the fungus in storage was also given by capex, closely followed by verderame sulphur dust (copper-oxide-chloride), the latter, however, being used only on

one farm. Neither of these compounds is actually deleterious from the standpoint of human consumption, though care in their use is indicated. Cupric sulphur gave moderately satisfactory results. Bouisol and sulsol were ineffective, adhesion being very poor and the appearance of the fruit liable to be spoilt, notably in the case of Henab Turki and Gros Colman. A distinct discoloration of Red Hanepoot berries was caused by cupric sulphur and to a much slighter extent by capex, which did not, however, adversely affect Henab Turki. It appears, from a preliminary investigation of the times of treatment and picking in relation to disease, that the dusts should be applied as shortly as possible before rain and the fruit picked as long as practicable (preferably about three days) after rain from 12 noon towards sunset, packing being left until next day. None of the three dusting machines used gave entirely satisfactory results, but the 'Original Gun' complied with most of the requirements. The preservation of the bloom on the fruits was found to be of great importance in the adhesion of the dusts.

The addition of 0·2 gm. of ammonium carbonate per bunch before wrapping [cf. ibid., xiv, p. 30] gave effective control of *Botrytis* and left practically no chemical favour. Sodium metabisulphite was also fairly satisfactory as a preventive of storage rot but bleached the fruit considerably and left a decided taste of sulphur [cf. ibid., xiii, p. 426]. The use of wrappers impregnated with 5 per cent. each of copper sulphate, potassium iodide, or ferric sulphate, and with 1 per cent. potassium permanganate produced only a temporary retardatory action on the rot.

ZACHAREWICZ (E.). **Traitement pour combattre en même temps la brunissure et la chlorose de la Vigne.** [Combined treatment against Vine 'brunissure' and chlorosis.]—*Prog. Agric. et Vitic.*, cii, 43, pp. 423–424, 1934.

As a combined treatment against vine 'brunissure' [*R.A.M.*, xii, p. 676; xiii, pp. 492, 616] and chlorosis [ibid., xiii, p. 745] a mixture consisting of 25 kg. dehydrated iron sulphate and an equal amount of potassium nitrate in 100 l. water, applied as a paint to the pruning wounds, gave satisfactory results.

SĂVULESCU (T.), SANDU-VILLE (C.), RAYSS (T.), & ALEXANDRI (V.). **L'état phytosanitaire en Roumanie au cours de l'année 1932–1933.** [Phytosanitary conditions in Rumania during the year 1932–1933.] —*Inst. Cerc. Agron. al României*, 12, 93 pp., 15 figs., 1 map, 1934. [Rumanian, with French translation.]

In 1932 infection of wheat in Rumania by *Puccinia triticina*, *P. glumarum*, and *P. graminis*, especially the first, continued during November and December. As in previous years, *P. triticina* overwintered by uredospores and resting mycelium, though *P. glumarum* and *P. graminis* failed to survive [*R.A.M.*, xiii, p. 152]. Late-sown winter wheats escaped autumn infection and developed no spring infection by *P. triticina*, spring wheats also remaining unaffected until later in the year. The rusts were favoured by cold, wet weather early in June 1933, when the thermohydric predisposition index [ibid., xiii, p. 690] was high (9·4), and a second infection period was induced by a cold,

wet spell during the first ten days of July, when the predisposition index reached 10·5, its highest point. Owing to the susceptible state of the wheat and the favourable weather, *P. glumarum* and *P. graminis* appeared on the leaf blades, sheaths, stems, and ears. The varieties least attacked (and therefore least susceptible to cold and rain) were American 15 and 26 [ibid., xii, p. 426], which were also very resistant to *Ustilago tritici* [cf. ibid., xii, p. 549]. After the attack of the previous year, the teleutospores of *P. graminis* were found in the soil to the number of 4 per sq. cm. or 400,000,000 per hect.; in May 1933 they germinated and carried heavy infection to barberries [cf. ibid., xii, p. 427; xiii, p. 152], which sustained the most severe attack ever recorded in Rumania. All areas became affected, and in one locality between 15th and 20th May 50 aecidia could be counted on a single leaf. Wheat fields surrounded by barberry bushes sustained heavy losses from black rust, which, however, became progressively less the farther the fields were from the alternate host [ibid., xiv, p. 88].

Wilted wheat seedlings showed infection by *Fusarium culmorum*, which was also present on maize roots, though, especially in fields weeded promptly, it caused less damage to this host than to wheat. The barley varieties most resistant to *U. nuda* were Hanna and Isaria, the most susceptible being Local neselectionat. Rye ergot (*Claviceps purpurea*) was very prevalent, and in one locality caused losses of 70 to 90 per cent.

Sunflowers in Bessarabia were attacked, chiefly at the base of the stem, by *Sclerotium complanatum* Tode, while *S. omnivorum* Van der Wolk was found on the stems, roots, and fruits of groundnuts. Chick pea anthracnose (*Ascochyta rabiei*) [ibid., xiii, p. 612] was present in practically every district where this host is grown. A partial chlorosis of eggplants with mottling and dwarfing of the leaves and a mosaic leaf mottle of chilli pepper [*Capsicum annuum*] are attributed to a virus. The latter host was also attacked by *Actinomyces todschlidowskii* Serb., which in some cases caused appreciable losses; the infection sites became re-infected later by *Alternaria capsici-annui* Săvul. & Sandu. Lettuces near Bucharest were widely attacked by *Aecidium lactucae-sativae* Syd., but although the attack was occasionally very active it was confined to two or three outer leaves; the losses sustained were slight and confined to a few localities.

Apricot apoplexy [ibid., xii, p. 227] was much more widespread than before. The disease, which has been present for a few years in Rumania, is attributed to (1) external predisposing factors, i.e., adverse weather, unsuitable soil, and unsatisfactory cultural conditions, (2) internal predisposing factors, i.e., gum accumulation in the vessels, with resultant asphyxiation, and (3) attack by weak parasites. It appears at the beginning of summer and the trees, which are then in active growth, wither, the leaves on a few or all of the branches turn yellow in two or three days and gum exudation ensues. A transverse section from an affected branch shows a brown discoloration of the cortex, cambium, and adjoining wood. The condition may cause from 30 to 50 per cent. loss.

Elm die-back (*Ceratostomella ulmi*) [ibid., xii, p. 666; xiv, p. 133] was prevalent throughout Rumania.

SIMMONDS (J. H.). **The work of the Pathological Branch.**—*Ann. Rept. Queensland Dept. of Agric. & Stock for the year 1933–1934*, pp. 67–70, 1934.

The following are some of the records of phytopathological interest contained in this report. During the period under review, blue mould (*Peronospora tabacina*) [*R.A.M.*, xiii, p. 214; xiv, p. 200] was an important factor in reducing the tobacco area in Queensland, where L. F. Mandelson obtained good commercial control with seed-bed applications of copper emulsion and colloidal copper [ibid., xiii, p. 332].

As in the previous season, speckle [ibid., xiii, p. 215] equalled or even surpassed leaf spot (*Cercospora musae*) as a cause of defoliation of bananas.

Under dry summer conditions in Queensland infection of Emperor mandarin oranges by black spot (*Phoma citricarpa*) [loc. cit.] becomes progressively worse from flowering time until January, but control can be effected by applications of Bordeaux mixture made during blossoming and again in December.

Wilt remains the major disease of pineapples [ibid., xii, p. 530]. Tests in sulphur-treated field plots showed that highly beneficial results may be expected if the acidity of fertile soils is increased. Pineapple black heart, which laboratory and cold storage tests indicated may be due to abnormal transpiration, was very serious in the late winter crop. Fruitlet core rot [ibid., viii, p. 53; xiv, p. 181] also caused heavy losses during the canning of the winter crop. Investigations largely confirmed the view that the disease is due to a *Penicillium*, the entry of which, through the walls of the floral chamber, is made possible chiefly by the activities of the pineapple mealy bug [*Pseudococcus brevipes*] and a Tarsonemid mite. The pineapple bacterial diseases known as 'marbled fruit' and 'pink' disease, originally recorded from Hawaii, were reported in Queensland for the first time; the former is of minor importance, but the latter may be serious, as the discoloration does not appear until after canning and boiling the fruit.

Papaw powdery mildew, caused by a species of *Sphaerotheca*, is most serious in late winter, when it may produce withering of the crown leaves and a grey scurf on the fruit. Black spot [ibid., xiii, p. 215] appears on the same host in late winter and lasts until summer, causing shedding of the flowers and young fruit, a black spot on the mature fruit, and a serious stem decay. This disease is associated with *Ascochyta caricae*, inoculations with pure cultures of which reproduced the condition. Inoculation tests showed that a species of *Phytophthora* associated with papaw crown rot was pathogenic [cf. ibid., xii, p. 77]. Transport rots of ripe papaws are usually associated with *A. caricae* and a *Gloeosporium*. In attempts to find the transmitting agent of yellow crinkle [ibid., xi, p. 157] inoculations by means of insects and the usual mechanical methods gave negative results.

Field trials with watermelon seed obtained by selfing varieties (received from Iowa) resistant to wilt (*Fusarium*) [*niveum*: ibid., xii, p. 495; xiii, p. 560 and below, p. 220] indicated that Iowa King, which combines resistance with desirable commercial qualities, may prove to be a promising substitute for the common susceptible varieties.

Recent research on Empire products. A record of work conducted by Government Technical Departments overseas. Agriculture.—*Bull. Imper. Inst.*, xxxii, 3, pp. 437–467, 1934.

The following items of phytopathological interest occur in this report. J. West, Botanical Section, Southern Provinces, Nigeria, supplies details of spraying and dusting experiments against black pod of cacao [*Phytophthora palmivora*: *R.A.M.*, xiv, p. 87] from 1931–4. The spraying (Bordeaux mixture) was done with knapsack machines and the dusting with a rotary blower, using cupryl. These treatments, combined with clean sanitation, pruning, and thinning, effected an appreciable increase in the yield of both main and mid-season crops besides reducing the incidence of infection, though the latter is stated seldom to exceed 12 per cent. even in the absence of treatment, provided harvesting is regular.

Seventy-seven local and 28 imported varieties of cassava are under investigation at Kumasi, Gold Coast, with a view to the development of a mosaic-resistant type [ibid., xiv, p. 146]. J. West's investigations in Nigeria have shown that this disease is gradually spreading inland from the coast, and as none of the indigenous varieties shows any sign of resistance it is proposed to introduce immune varieties from the Gold Coast, Sierra Leone, and the West Indies, and if necessary, to carry out hybridization experiments between foreign and native types.

A destructive tuber rot of yams [*Dioscorea* sp.] in the Ibadan and Ilorin districts of Nigeria appears to be primarily due to the eelworm *Hoplolaimus bradys*, which paves the way for more extensive infection by fungi (*Rhizoctonia* [*Corticium*] *solani* and *Fusarium oxysporum*) and bacteria. The results of soil analyses indicate that alkalinity and a high organic content are contributory factors in the etiology of the disease, which further appears to decline in yam crops following cereals and cotton.

Martyn (E. B.). **Report of the Botanical and Mycological Division for the year 1933.**—*Divisional Repts. Dept. of Agric. British Guiana for the year 1933*, pp. 105–111, 1934.

During the period under review sugar-cane 'root disease' [*R.A.M.*, x, p. 753] became increasingly prevalent in the Berbice district of British Guiana, though it was rare in West Demerara. It appears with the first heavy showers that fall after a drought and ceases when the affected area is irrigated. Analysis showed that affected shoots contained more chlorine than green, healthy ones, but that both contained about the same amount of magnesium, indicating that the disease is due, not, as was previously thought, to excess magnesium but to an excess of soluble salts, such as sodium chloride, in the soil. In future, the disease is to be referred to as 'salt blight'.

Infection experiments showed that the strain of *Fusarium moniliforme* [*Gibberella moniliformis*] associated with the disease known locally as 'man rice' [ibid., xiii, p. 357] was less virulent than the strain causing a similar disease obtained from Madras. Inoculations of five-months-old ratoons of P.O.J. 2878 sugar-cane with the 'man rice' fungus produced on a few leaves symptoms identical with those described and figured for 'pokkah boeng'.

Further investigation into phloem necrosis of Liberian coffee [*Phytomonas leptovasorum*: loc. cit.] in the North-West District indicated that the age and management of the trees are the main factors concerned in promoting the disease. Trees sixteen years old or over are particularly susceptible. The bad outbreak of 1932 began with the onset of dry weather in September, the trees dying off in large numbers until the rains started again in December; the total loss was approximately 37 per cent.

A bad outbreak of scab (*Sporotrichum citri*), the first record of this disease in the Colony, occurred on Seville orange seedlings. The affected plants were destroyed and the remainder sprayed regularly with Bordeaux mixture, with the result that by the end of the year the disease appeared to have been stamped out.

Mosaic disease was observed on tomato varieties at Whim sub-station on the Corentyne coast, the affected plants showing the fern-leaf type of distortion [ibid., xiv, p. 132]; the Early Market variety was rather less severely affected than Marglobe.

Cowpeas at the Cecilia sub-station were attacked by mosaic [ibid., ix, pp. 187, 666].

SHEPHERD (E. F. S.). **Diseases of garden plants and fruit trees in Mauritius.**—*Mauritius Dept. of Agric. Bull.* 43 (*Gen. Ser.*), 16 pp., 1934.

Popular notes are given on a number of well-known fungous, bacterial, and virus diseases affecting fruit, vegetable, and miscellaneous crops in Mauritius, supplemented by directions for the preparation of some standard fungicides.

Division of Botany.—*Fifty-third Ann. Rept. New York* (*Geneva*) *Agric. Exper. Stat. for the fiscal year ended June 30, 1934*, pp. 24–32, 1934.

This report, which is on the same lines as those for previous years [cf. *R.A.M.*, xiii, p. 357] contains, among others, the following items of phytopathological interest. During the first year's extensive tests with red [cuprous] oxide of copper dust as a fungicide [ibid., xiv, p. 151] for seed and foliage treatment it appeared to give control of apple scab [*Venturia inaequalis*] and certain vegetable diseases, such as tomato late blight [*Phytophthora infestans*]; it is being tested on a wide range of fruit, vegetable, and flower diseases. It is believed that its injurious effect on the host plants can be eliminated by a new manufacturing technique that is being evolved.

During 1933 red raspberry mosaic [ibid., xiii, p. 357] remained the most prevalent single virus disease of raspberries in the State, though yellow mosaic [ibid., vi, p. 676] increased significantly. The importance of brambles as disseminators of virus diseases becomes every year more marked, especially as regards wild and escaped red raspberries which are common in woods and fence rows near cultivated plantings. The value of eradicating wild red raspberries near cultivated varieties was twice demonstrated. Further inoculation experiments on caged and uncaged black raspberries [*Rubus occidentalis*] confirmed previous results in showing that the mild mottling universally present in Columbian purple raspberries [*R. neglectus*: ibid., xiii p. 358] is an expression of red raspberry mosaic. Plantings of this resistant purple variety, however

vigorous and productive they may be, are a menace to healthy but susceptible raspberries growing in the vicinity. Several new varieties of black raspberries reputedly free from virus diseases in various parts of the eastern United States failed to show any marked immunity when exposed to natural infection in four localities in the intensive raspberry-growing area of western New York.

The new Naples variety of black raspberries appears to be highly resistant to anthracnose [*Elsinoe veneta*: ibid., xiv, p. 181], and it is confidently anticipated that it will become of commercial prominence. The Quillen variety, practically unaffected in Indiana, is to be tested for resistance at Geneva.

Combined germination and disease tests made on some 2,500 stocks of canning crop and vegetable seeds showed that peas grown in the western areas of New York were relatively free from the common seed-borne diseases; species of *Ascochyta* and *Fusarium* developed on a few samples of imported peas and those grown in the eastern parts of New York.

An examination of 600 examples of oats from all parts of New York showed that many carried an *Alternaria* which was not, however, injurious to the seedlings; *Helminthosporium avenae-sativae* [*H. avenae*: ibid., xii, p. 162] and *Erwinia* [*Bacillus*] *avenae* [ibid., x, p. 10] were also present, causing root rot. Vetch seed from seven European countries and several places in the United States carried from 1 to 15 per cent. infection by *Ascochyta viciae* [cf. ibid., ix, p. 273]; the stems of vetch seedlings were killed by a new disease due to a *Rhizoctonia*.

Sixth Biennial Report of the Michigan State Department of Agriculture for the fiscal years ending June 30, 1933 and June 30, 1934.—130 pp., 5 figs., 2 maps, 1934.

This report contains the following items of phytopathological interest. As a result of the eradication of 6,000,000 common barberry bushes in Michigan and twelve other north-central grain-producing States since 1918, the average loss from stem [black] rust of cereals [*Puccinia graminis*] was reduced to a trace (0·3 per cent.) in 1933 as compared with the average of 1,657,000 bushels (5 per cent.) per annum from 1916–33 [*R.A.M.*, xii, p. 203]. It is estimated that the barberry eradication campaign, the annual cost of which is less than $300,000, has already been the means of saving $20,000,000 each year to grain-growers in the thirteen participating States. During the period from 1st July 1932 to 30th June 1934, 153,035 bushes were destroyed on 1,241 properties, very valuable assistance in the work having been rendered by the staffs and pupils of schools and colleges.

Very careful inspection is stated to be necessary to deal with the increasing incidence of pests and diseases of bramble fruits. During the period under review some 2,000 acres of raspberries were annually examined and the diseased plants rogued out, special attention being paid in 1932 to the distribution of crown gall [*Bacterium tumefaciens*: ibid., xiv, p. 180].

The percentage of virus diseases (red suture, rosette, littles, and yellows) of peach [ibid., xii, p. 203; xiii, p. 563] in the summers of 1932 and 1933 was 4·6 and 1·4, respectively.

In the course of the biennium two counties were added to those known to be infested by white pine [*Pinus strobus*] blister rust [*Cronartium ribicola*], one in the Upper and the other in the Lower Peninsula [ibid., xii, p. 203; cf. also xiii, p. 208] and a considerable extension of the disease was observed in the areas already under investigation. The total number of *Ribes* eradicated during the period under review (inclusive of the second campaign in three counties and of the third in one) was 7,478,182. Nursery sanitation work, consisting in the removal of all wild and cultivated currant and gooseberry bushes within 1,500 ft. of the nursery, and of black currants within one mile, was carried out in four localities covering a total area of 961 acres, on which the number of bushes eradicated amounted to 88,350. The total number of black currant bushes eradicated in the 40 infested counties of the Lower and the 10 of the Upper Peninsula from 1932–4 was 37,407.

Botany and plant pathology section.—*Ann. Rept. Iowa Agric. Exper. Stat. for the year ending June 30, 1934*, pp. 64–80, 1 fig., 1934.

This report for 1933–4 [cf. *R.A.M.*, xiv, p. 149] contains among others the following items of phytopathological interest. Watermelon varieties resistant to wilt [*Fusarium niveum*: ibid., xiv, p. 143] which will meet the most critical demands of the grower and consumer are rapidly being evolved from the segregates obtained by J. J. Wilson in crosses between susceptible varieties and the resistant Iowa Belle.

Four physiologic forms of *Puccinia coronata avenae* [*P. lolii*] not previously identified were isolated by H. C. Murphy from collections made in 1933, bringing the total number of known forms to 37. Forms 33 and 34 are able to attack the hitherto highly resistant Bond variety of oats; the last-named was collected in Louisiana and the adjoining States in 1933, but form 33 has not yet been isolated from field collections. Oat plants infected with crown rust yielded less grain, straw, and roots than uninfected ones. Except where the yield of grain was entirely inhibited, the weight of roots was reduced most, and that of the straw least. The ratio of roots to tops was greatly decreased, in proportion to the duration and severity of the rust infection. Susceptible plants first infected in the seedling stage used 290·8 per cent. more water per unit of dry weight than rust-free plants, while resistant plants used only 39·9 per cent. more. Oat plants infected with *P. lolii* or stem rust [*P. graminis avenae*] were far more susceptible to frost injury than rust-free plants.

In a test by W. J. Henderson evidence was obtained that it is unprofitable to grow sugar beets two years in succession when leaf spot (*Cercospora beticola*) is present, as the disease is carried over in the field from the previous crop and causes severe damage. The initial infection in the author's experiment came from the soil.

A severe canker of one- and two-year old cherry stock was tentatively attributed by G. L. McNew to *Bacterium pruni* [ibid., xiv, p. 178]. The disease was particularly severe on Black Tartarian, Bing, and Early Richmond, but was not found on Mahaleb stocks, and was very uncommon on Montmorency.

For the second consecutive year I. E. Melhus observed that *Diplodia zeae* was able to invade the crown of maize plants from infected soil.

Plants growing in infected soil the moisture content of which was either extremely high or extremely low became heavily infected, their dry weight falling to 65 per cent. of normal. In seed disinfection experiments by C. S. Reddy with twelve commercial and new dust fungicides the increases in the yields from dusted maize seed infected with *D. zeae* averaged 8·9 bushels per acre, the corresponding figure for dusted, but almost disease-free seed being 2·7.

When one-year-old white ash [*Fraxinus americana*] trees were inoculated (through wounds) with *Dothiorella fraxinicola*, three months later large, swollen cankers developed, with immature fruiting bodies forming subepidermically in the dead bark; similar inoculations with *Cytospora annularis* (which a survey showed was the fungus most commonly present on white ash in Iowa) demonstrated that this was the most virulent of the organisms tested, causing pronounced sunken cankers with swollen margins round the wounds. The fungus killed the tissue beyond the wound, and in young branches practically girdled the tree.

Forty-sixth Annual Report of the Arkansas Agricultural Experiment Station for the fiscal year ending June 30, 1934.—*Arkansas Agric. Exper. Stat. Bull.* 312, 63 pp., 1934.

Preliminary experiments with detached portions of cotton plants resistant and susceptible to wilt (*Fusarium vasinfectum*) indicate that the character for resistance is not localized in the roots but is found also in the aerial organs. The movement of the fungus through the vascular system is much more rapid in the stems of susceptible plants than in those of resistant ones, and the latter apparently contain a substance capable of inhibiting the growth of the pathogen in culture. The incidence of cotyledonary infection by *Bacterium malvacearum* on cotton seedlings was considerably reduced by early (end of April and beginning of May) seed treatments with ceresan and new improved ceresan, but by mid-season no difference in the amount of angular leaf spot could be detected on the various plots.

Further investigations by H. R. Rosen on apple and pear fireblight [*Bacillus amylovorus*: *R.A.M.*, xii, p. 699; xiv, p. 110] indicated that, under Arkansas conditions, the pathogen does not remain viable as long as in the cooler climates of the northern United States and Canada. In Bartlett pear shoots it apparently failed to survive the winter of 1933–4 on the exposed surface of diseased material. A new copper phosphate compound was found to be equally effective with Bordeaux mixture 1–3–50 in the control of *B. amylovorus*.

A *Sclerotium* which is the agent of a serious rot of potatoes, cantaloupes, and other cultivated plants, has been isolated by the same worker from common crabgrass [*Panicum sanguinale*] and ragweed (*Ambrosia artemisifolia*).

Most of the blighting of rice observed in 1933 was found by E. M. Cralley to be due to species of *Fusarium* and *Rhizoctonia* [*Corticium*] *solani*, though *Helminthosporium oryzae* [*Ophiobolus miyabeanus*: ibid., xiii, p. 800] and *Pythium* sp. were also involved to some extent and *S. rolfsii* was isolated from diseased seedlings collected in Louisiana. Stands of the Supreme Blue Rose variety were benefited and the yields increased by some 5 bushels per acre by seed treatment with formalde-

hyde, ceresan, and copper-lime dust. In maize meal agar cultures, the germination of rice smut (*Tilletia horrida*) spores [ibid., xiii, p. 653] was by a non-septate promycelium, 10 to 300 by 5 to 8 μ. The primary sporidia, numbering 30 to 50, are cylindrical, usually curved, formed in whorls at the promycelial tip, and measuring 35 to 55 by 2 μ; they may produce secondary sporidia directly or indirectly on a mycelium. E. M. Cralley and E. C. Tullis found *Sclerotium hydrophilum* associated with a rice disease, the symptoms caused being mild and the only external evidence of infection the occurrence of white, later dark brown, spherical, sometimes elliptical or dumb-bell-shaped sclerotia, 350 to 850 μ in diameter, in the outer leaf sheaths. Other hosts of the fungus are *Echinochloa* [*Panicum*] *crus-galli*, *E. colona* [*P. colonum*], and *Typha latifolia*.

The Forty-seventh Annual Report of the Colorado Agricultural Experiment Station for the fiscal year 1933–34.—28 pp., 1934.

The following items of phytopathological interest occur in this report. One strain of Turkestan lucerne has been found resistant to bacterial wilt [*Aplanobacter insidiosum*: *R.A.M.*, xiv, p. 174] but it lacks certain desirable fodder qualities, is a relatively low yielder, and is subject to various other diseases. Progress is being made, however, in the development of lines combining resistance with productivity.

Where the foot root of wheat due to *Helminthosporium sativum* [ibid., xiii, p. 758] constitutes a problem, planting in fairly cool soil about 15th September has been found to give practically complete control, e.g., in the Akron district.

A pepper [*Capsicum annuum*] wilt caused by *Phytophthora capsici* [ibid., xii, p. 535] is under investigation to determine the conditions governing infection and the occurrence of varietal resistance.

Field spraying for purple blotch of onions [ibid., xiii, p. 151] has resulted in a decrease of the losses from 42 to 7 per cent.

A species of *Sclerotinia* caused considerable damage to Chinese elm [*Ulmus* (?) *campestris* var. *chinensis*] seedlings in the spring, attacking the roots and stem bases, but it appears to have been controlled by rational sanitation.

Peach mosaic [ibid., xiv, p. 40] was observed in the vicinity of Palisade, necessitating the eradication of diseased trees.

Crown rot and damping-off of *Pyrethrum* [*Chrysanthemum* (?) *coccineum*] caused, respectively, by *Phytophthora* sp. and *Pythium* sp. were controlled by improved cultural practices.

Botany.—*Forty-seventh Ann. Rept. Pennsylvania Agric. Exper. Stat. for the fiscal year ending June 30, 1934* (*Bull.* 308), pp. 15–16, 1934.

In six years' potato-breeding experiments against virus diseases in Pennsylvania [cf. *R.A.M.*, x, p. 85] over 6,000 seedlings have been grown, the result of crossings and self-pollinations, using as parent plants many old, local, naturally resistant varieties. One Cobbler type has been developed which is remarkably resistant.

Attempts to prevent by spraying the appearance of wildfire [*Bacterium tabacum*] in artificially contaminated tobacco field beds were completely successful only when the application of Bordeaux mixture was begun

at seeding time [ibid., xi, p. 497]; copper-lime applied at the same time did not always give plots free from the disease. When plots in which the disease had been present in 1932 were planted with healthy seedlings in 1933, the disease appeared on three out of six plots. It was also found naturally infecting *Physalis virginiana*, and inoculations of tobacco with pure cultures of the organism isolated from this host gave positive results.

MARCHIONATTO (J. B.). **Argentine Republic: plant diseases observed in the country.**—*Internat. Bull. of Plant Protect.*, viii, 11, p. 241, 1934.

Sphaceloma [*Elsinoe*] *piri* [*R.A.M.*, xi, p. 724], hitherto observed only on pear in the Argentine, was detected during 1934 on apple leaves and fruit in the province of Buenos Aires. A species of *Melanconium* (so far unidentified) was found producing cankers on the twigs and branches of *Eucalyptus viminalis* in the same province. Superficial damage to potato tubers from silver scurf (*Spondylocladium atrovirens*) [ibid., xiii, p. 592] was reported for the first time, also from Buenos Aires.

STEYAERT (R. L.). **Résumé du rapport sur l'activité du laboratoire de phytopathologie (Stanleyville et Bambesa) en 1933 et la campagne cotonnière 1933–1934.** [Résumé of the report on the activity of the Stanleyville and Bambesa phytopathological laboratory in 1933 and the Cotton season 1933–1934.]—*Bull. Agric. Congo Belge*, xxv, 3, pp. 376–385, 1934. [Received January, 1935.]

In an experiment conducted in the Belgian Congo in 1933, the bolls from four cotton plants in each of five plots sown at fortnightly intervals from 10th July were collected every week and the percentage amounts of internal boll disease (*Nematospora coryli* and *N. gossypii*) and 'red rot' present were calculated. The latter condition, which is not apparent externally, is a wet, later dry, garnet-red rot, probably of bacterial origin, generally affecting the whole segment; this dries up and the placenta becomes hypertrophied.

The data obtained showed that internal boll disease increased throughout the season, the figures for the five plots being, respectively, approximately 0·7, 0·3, 1·4, 2·4, and 6 per cent., whereas the amount of red rot present remained practically constant at approximately 1 per cent. in the first four plots, but jumped to 3 per cent. in plot 5. These figures refer to the total number of bolls on the plants and include those in all stages of development, from the smallest to those about to open. Internal boll disease occurs in bolls 2·5 cm. in diameter, very occasionally in smaller ones, and never in those under 1·5 cm. in diameter.

Seedling damping-off, caused chiefly by *Rhizoctonia* [*Corticium*] *solani* and, to a very slight extent, by *Sclerotium rolfsii*, was very severe, the percentage infection in the five plots and a later-sown one being, respectively, 7·5, 1·5, 11·7, 7·2, 7·2, and 4·5 per cent. An inverse correlation was established between intensity of infection and increasing soil temperature and sun heat.

In two localities young plants (with six to seven adult leaves) of the newly introduced Dixie Triumph cotton were attacked by angular leaf spot [*Bacterium malvacearum*], though Triumph Big Boll remained unaffected.

Cotton in the vicinity of Wamba-Ibambi developed a wilt [the symptoms of which are described] due probably either to *Fusarium vasinfectum* or *Verticillium albo-atrum*; further investigations into this condition are in progress.

A considerable proportion of the berry borers (*Stephanoderes hampei*) present in coffee plantations were parasitized by *Beauveria bassiana* [*R.A.M.*, x, p. 188]. The highest mortality (66·6 per cent.) due to the fungus occurred in July, the figure rapidly decreasing as harvest-time approached. Laboratory tests indicated that the percentage of infected insects was higher on green than on more mature berries, and that infection was most intense at an atmospheric humidity of about 80 per cent. Locally, nearly all the berries are in the green stage in July, in which month attempts at controlling the insects by dusting or spraying with the spores of *B. bassiana* are to be made.

Briton-Jones (H. R.). **The diseases and curing of Cacao.**—x+161 pp., 37 figs., London, Macmillan & Co., Ltd., 1934.

In this manual, written as the result of a discussion at the Imperial Mycological Conference (1929) [*R.A.M.*, ix, p. 259] as to the need for a series of hand-books on the diseases of the major tropical crops, the author discusses the symptoms, etiology, and control of all the important disorders of cacao, grouped under the headings of root, stem, and pod diseases, followed by a separate chapter on witches' broom (*Marasmius perniciosus*) [ibid., xiv, p. 87]. A final chapter deals with the 'curing' of cacao, the widely scattered literature on which is often difficult of access. Throughout the book, to which a bibliography of 192 titles (in addition to a special one of 40 titles dealing with curing) is appended, the author has sought to avoid the use of technicalities, since the chief objects of the agricultural officers and planters, for whom it is primarily intended, are the detection of a disease by its macroscopic symptoms in the field and the knowledge of practicable control measures. On this account, the work is exceptionally full in its treatment of the more practical aspects of cacao disease control by improved methods of cultivation and other measures directed towards securing a vigorous stand. It is thus one which all those who are concerned with the crop, whether as growers or members of tropical agricultural departments, will find very valuable. In the sections dealing with diseases such as pod rot and canker (*Phytophthora palmivora*) and witches' broom, stimulating reflections based on the author's personal observations and those of his colleagues in Trinidad will interest plant pathologists who are concerned with the diseases of tropical perennial crops.

Mention should be made of the excellent photographic reproductions illustrating the work.

Yakoubtziner (M. M.). Пшеница устойчивая против грибных заболеваний. (**Triticum Timopheevi Zhuk.**). [A Wheat resistant to fungal diseases (*Triticum timopheevi* Zhuk.).]—*Bull. of Appl. Bot., Genetics, and Plant Breeding*, Leningrad, Ser. A (*Plant Industry in U.S.S.R.*), 11, pp. 121–130, 1 fig., 1934.

The chief purpose of this note is to draw the attention of wheat-breeders to a species of emmer wheat [the botanical characteristics and

genetical affinities of which are discussed in some detail] which was described in 1928 by Zhukovski [Joukovsky] under the name *Triticum timopheevi* (*Bull. of Appl. Bot., Genetics, and Plant Breeding*, Leningrad, xi, 2, pp. 59–66, 1928). Its natural area of dispersion is restricted to the foothills (300 to 1,000 m. high) of south-west Georgia [Transcaucasia], where it is usually grown in mixture with a wild variety of *T. monococcum*, and is known under the local name 'zanduri'. Field observations in its natural home, as well as preliminary trials in various regions of the U.S.S.R., indicated that this wheat is practically immune from black and brown rusts (*Puccinia graminis* and *P. triticina*) and only very slightly susceptible to yellow rust (*P. glumarum*), besides exhibiting high resistance to other parasitic fungi, e.g., mildew [*Erysiphe graminis*], bunt [*Tilletia caries* and *T. foetens*], loose smut [*Ustilago tritici*], and *Fusarium* spp.

While the direct introduction of this wheat into general cultivation is not recommended, owing to certain undesirable characters it possesses, it is believed that it may eventually prove to be of considerable value as a parent in breeding disease-resistant wheats, although all attempts in this direction have been so far unsuccessful, owing to the fact that the hybrids obtained were either entirely sterile or only weakly prolific. The work, however, is being continued on the lines of the triple hybrid method suggested by Kostoff in 1932.

NEWTON (MARGARET) & BROWN (A. M.). **Studies on the nature of disease resistance in cereals. I. The reactions to rust of mature and immature tissues.**—*Canadian Journ. of Res.*, xi, 5, pp. 564–581, 1 pl., 1934.

A full tabulated account is given of controlled experiments which showed that when varieties of wheat, oats, and barley resistant in the seedling stage to certain physiologic forms of stem [black] rust (*Puccinia graminis*) [*R.A.M.*, x, p. 170] were inoculated by means of a hypodermic syringe with a suspension of the uredospores of these forms [ibid., viii, p. 865] in different parts of the culm, the young, rapidly growing portions (e.g. the basal part of the peduncle and of the flag-leaf sheath) were very susceptible, whereas the older, more mature portions were highly resistant. The same was also found to be true for varieties possessing mature plant resistance. The fact that both resistant and susceptible tissues are present in the host at the same time, has little or no bearing on field resistance, as the susceptible portions of the resistant plants are generally quite effectively protected by highly resistant parts. Although large pustules of stem rust may occasionally develop above some nodes of resistant plants, the yield of the latter is not reduced in any measurable degree.

Further tests showed that the young, rapidly growing tissues are also susceptible to a number of rusts which are not natural parasites of the particular cereal concerned; for instance, under the experimental conditions *P.g. tritici* attacked oats and rye, and *P.g. avenae* and *P. triticina* attacked barley. As the susceptible parts grow older, however, they become as resistant as the remainder of the plant.

The work gave also some evidence that resistance to black rust is not due, as suggested by Helen Hart [ibid., xi, p. 562], to the failure of the germ-tubes of the rust to enter the stomata of the sheath or, as suggested

by Hursch [ibid., iii, p. 575] to the morphological structure of the hosts, but rather to some characteristic of the cells or of the protoplasm involving changes which, with advancing age, render the tissues highly resistant.

JOHNSON (T.) & JOHNSON (O.). **Studies on the nature of disease resistance in cereals. II. The relationship between sugar content and reaction to stem rust of mature and immature tissues of the Wheat plant.**—*Canadian Journ. of Res.*, xi, 5, pp. 582–588, 1934.

The results of the studies reported in this paper showed that both in the tested wheat varieties resistant in the adult stage to stem [black] rust (*Puccinia graminis tritici*) and in those which in the same stage show little or no resistance, the sugar content of the young (susceptible) tissues [see preceding abstract] is considerably higher than in the older (resistant) ones. The difference was particularly great in the content of reducing sugars but rather slight in that of the disaccharides (expressed as invert sugar). Since, however, the differences were much of the same order in all the varieties tested, irrespective of their resistance or susceptibility to rust in the adult stage, it is not believed that there exists any direct relationship between sugar content and reaction of the tissues to the rust [cf. *R.A.M.*, xiv, p. 52].

THOROLD (C. A.). **Production of an artificial epidemic of Wheat stem rust in Kenya Colony.**—*Ann. of Appl. Biol.*, xxi, 4, pp. 614–620, 1 pl., 1934.

In pointing out that in Kenya the selection of wheat varieties resistant to stem [black] rust (*Puccinia graminis tritici*) has hitherto been hampered by the fact that only one or two of the four physiologic forms of the rust so far known to occur in the colony [*R.A.M.*, xiii, p. 361] may be present naturally in a given district in any one year, the author gives a detailed account of a method which was successful in 1933 in establishing an epidemic of all the four forms at the Experimental Station at Njoro. Briefly stated, the method consists in sowing the wheat varieties and hybrids to be tested in rows surrounded by rows of varieties known to be susceptible to the four rust forms and establishing the rust epidemic on the latter, which should be sown at least ten days before the populations to be tested. Since black rust appears to develop and spread best on Marquis wheat which is susceptible to all the local forms, the method could be further improved by using this variety for the surrounding rows, in combination with other varieties differentially susceptible to each one of the four forms, for the purpose of determining whether the latter are multiplying naturally in the surrounds. The only precaution necessary is that the varieties should be quite distinct in habit when growing together in the row.

CALNICEANU (C.). **Beiträge zur Resistenzzüchtung gegen Puccinia triticina Erikss.** [Contributions to breeding for resistance to *Puccinia triticina* Erikss.]—*Kühn-Archiv*, xxxvii, pp. 57–90, 1934.

The results are fully discussed and tabulated of investigations at the Halle Agricultural Institute from 1931–3 on various aspects of the pro-

blem of physiologic specialization in brown rust of wheat (*Puccinia triticina*) in relation to the work of breeding for resistance [*R.A.M.*, xiii, p. 755].

Inoculation experiments with a combination of equal parts of two physiologic forms (13 and 15) of *P. triticina* on the susceptible Strubes Dickkopf [Squarehead] variety demonstrated that the formation of mixed pustules is possible. Simultaneous tests with a combination of the same forms on the Malakoff, Mediterranean, and Loros varieties showed that the characteristic reaction of these wheats to the individual forms is maintained in the mixed inoculation; only that component of the mixture forms pustules which ordinarily infects the given variety. Malakoff, for instance, responded only to form 13 and Mediterranean to 15; Loros, which in nature is slightly less resistant to form 15 than Malakoff, was attacked almost exclusively by 13 but developed minute necrotic pustules of 15. The same behaviour was maintained when the two physiologic forms were inoculated into the three varieties not simultaneously but at intervals of three days, and also when infection with *P. triticina* was preceded by inoculation with five German collections of *Tilletia tritici* [*T. caries*: cf. ibid., ix, p. 706; xii, p. 276].

An analysis of the physiologic forms composing the local brown rust collections obtained in 1932 showed that 14 generally predominates, in some cases together with forms 11 and 15, chiefly the former. As regards other parts of Germany and Rumania, the analytical results substantiate in a general way the conclusions reached by previous workers [ibid., xii, p. 619].

Inoculation tests on 479 European, American, and Oriental wheat varieties with forms 11, 13, 14, 15, 17, and 20 of *P. triticina* showed that the majority of the *Triticum vulgare* varieties are susceptible to all six forms. Twenty-one, however, showed resistance to some forms, e.g. Normandie, resistant to 11, 14, and 15 but susceptible to 13, 17, and 20. Only three, Ardito, Aurore, and Varonne, proved resistant to all six forms. All the varieties of *T. durum* used in the tests, e.g., Kubanka, Mindum, and Velvet Don, were more or less resistant to all six forms of *P. triticina*.

The results of inoculation tests on a number of winter and summer wheat selections, such as Peragis × Normandie, Ridit × Panzer III, and Rimpaus hybrid × Kronenweizen, indicated that resistance to *P. triticina* may be readily combined with a similar reaction to *P. glumarum* [ibid., xii, p. 208; xiii, p. 757].

MELCHERS (L. E.). **Investigations on physiologic specialization of Tilletia laevis in Kansas.**—*Phytopath.*, xxiv, 11, pp. 1203–1226, 1 fig., 1 map, 1934.

The increasingly severe outbreaks of wheat bunt (*Tilletia laevis*) [*T. foetens*] in Kansas [*R.A.M.*, xiii, p. 751] in recent years are probably due both to the appearance of more virulent strains of the fungus and to changes in the wheat varieties grown. Seven physiologic forms of the fungus have been differentiated by their types of infection on the Turkey, Martin, Hussar, White Odessa, Oro, Ridit, and Banner Berkeley varieties in four years' tests [the results of which are fully discussed and tabulated] at the Agricultural Experiment Station, Manhattan. A

dichotomous key for use in the separation of the forms is given. Form 1, characterized by the virtual absence of infection on all varieties except Kanred, was found to be the most widely distributed in the State. The varieties Turkey × Bearded and Yogo proved resistant to all the Kansas bunt collections used in the trials.

The reinoculation of *T. foetens* on resistant wheat varieties showed that small percentages of bunt in the previous season increased to a significant degree in 10 out of 32 cases. In Hussar and White Odessa the increases were so extensive (from 7·4 to 47·2 and from 1·1 to 37·9 per cent., respectively) as to suggest the development of new forms by segregation following hybridization.

Potato-sucrose (4 per cent.) and oatmeal-dextrose (3 per cent.) agar gave the best results in cultural differentiation among the physiologic forms under observation, five of which uniformly maintained their striking divergences in colour, marginal type, topography, surface growth, and consistency.

The occurrence of physiologic specialization in *T. foetens* in relation to breeding for bunt resistance in winter wheat is briefly discussed.

HERMANN (S.) & NEIGER (R.). **Beeinflussung der Keimfähigkeit von Weizen durch Beizung mit Salizylsäure und Salizylsäureverbindungen.** [The influence on Wheat germinability of disinfection with salicylic acid and salicylic acid compounds.]—*Beih. Bot. Centralbl.*, lii, A, 3, pp. 577–583, 1934.

In continuation of their experiments at Prague, Czecho-Slovakia, on the action of salicylic acid and some of its compounds on wheat bunt (*Tilletia tritici*) [*T. caries*: *R.A.M.*, xiv, p. 90], the writers tested the effect of salicylic acid and certain salicylates on the germinability of the seed-grain.

Germinative capacity was not adversely affected by 30 minutes' immersion in solutions of magnesium, calcium, strontium, and barium salicylates at concentrations up to 0·5 per cent., the sodium and potassium salicylates being innocuous up to 2 per cent. At 0·1 per cent. acid copper salicylate did not injure germinative capacity, but at 0·25 and 0·5 per cent. some delay was noticeable and at higher strengths or under prolonged treatment the percentage of germination was reduced. Zinc salicylate caused no damage at 0·5 per cent., but at higher concentrations there was a gradual reduction of germination. Marked delay in germination followed the use of cadmium salicylate at 0·25 and 0·5 per cent., generally accompanied by injury to the root system; by the tenth day, however, the germination figures were normal.

Dusting with salicylic acid at 0·25 to 0·3 per cent. caused no ill effects, but at higher concentrations the germinative capacity rapidly declined until at 1 per cent. it was totally inhibited. Up to 1 per cent. lead and mercurie oxide salicylates were innocuous, stunting being liable to occur, however, at higher strengths. No detrimental effects on seedling germination and development were exercised by basic copper salicylate at concentrations up to 1 per cent. As already mentioned in the previous paper, 'hajkol' dust gave a definite stimulus to germination, especially at 0·25 per cent.

MAINS (E. B.). **Inheritance of resistance to powdery mildew, Erysiphe graminis tritici, in Wheat.**—*Phytopath.*, xxiv, 11, pp. 1257–1261, 1934.

Norka wheat is highly resistant to physiologic form 1 of powdery mildew of wheat (*Erysiphe graminis tritici*) in Michigan [*R.A.M.*, xii, p. 362], while susceptible to form 2. The progenies of crosses between this variety and the susceptible Webster, Ceres, Chinese, Kota, Malakoff, Reliance, and Warden segregated into plants highly susceptible to and virtually immune from form 1, the ratio of the latter to the former being 3:1. Of the 662 F_3 lines of the Norka × Chinese cross inoculated with this form, 160 proved to be uniformly resistant, 349 contained resistant and susceptible individuals, and 153 were consistently susceptible, suggesting a single genetic factor. The F_3 lines of the Norka × Reliance cross were also close to the 1:2:1 ratio. In both crosses resistance is based on a simple, dominant factor.

Norka being also highly resistant to form 3 of leaf [brown] rust (*Puccinia triticina*) [ibid., v, p. 477], the F_2 of the Norka × Ceres (susceptible) cross was simultaneously inoculated with this form of the rust and form 1 of the mildew. Of the 1,834 individuals studied for rust reaction 1,409 were resistant and 425 susceptible, resistance evidently depending on a single Mendelian factor. Of these plants 106 were susceptible to both rust and mildew, 319 susceptible to the former and resistant to the latter, 382 resistant to rust and susceptible to mildew, and 1,027 resistant to both, giving a ratio of approximately 1:3:3:9 and so agreeing closely with the expected figures for the segregation of two independent factors.

Of the 3,333 F_2 plants of a cross between Red Fern (highly resistant to both forms of mildew) and the susceptible Chinese, 2,508 were resistant and 825 susceptible, giving an approximate ratio of 3:1 and again showing resistance to be due to a simple, dominant Mendelian factor. Though Hope wheat is also resistant to form 1 of the mildew, its reaction is somewhat variable. The F_3 lines of the cross between this variety and Chinese gave 51 uniformly resistant, 122 segregating, and 55 consistently susceptible. Crossed with Marquis (susceptible), 59 of the F_3 lines were uniformly resistant, 122 segregated, and 55 were consistently susceptible. In the segregating group in both these crosses a ratio of about 1 resistant to 3 susceptible was obtained, indicating that the resistance of Hope to form 1 is governed by a single recessive factor. The same is probably the case with Sonora, in a cross between which and Chinese, 38 of the 131 F_2 plants were highly resistant and 93 very susceptible. Of the 297 F_2 plants in a cross between the highly variable Michigan Amber 29—1—1—1 and Chinese, 81 were resistant and 216 susceptible, indicating that the resistance of the former variety, which is apparently confined to the seedling stage in the greenhouse, is also inherited as a simple recessive factor.

HOFFMANN. **Bekämpfung der Fusskrankheiten des Weizens.** [Control of the foot rots of Wheat.]—*Deutsche Landw. Presse*, lxi, 46, p. 570; 47, p. 582, 1934.

There are stated to be two types of foot rot of wheat in Schleswig-Holstein, viz., blackleg (*Ophiobolus*) [*graminis*] and lodging (*Cerco-*

sporella herpotrichoides) [*R.A.M.*, xiii, p. 689; xiv, p. 157]. Of the first importance in the control of the former disorder is an absolute nutritional equilibrium, to which end an adequate foundation must be laid with lime, potash, and phosphoric acid. Nitrogen should be given in the form of well-rotted stable manure rather than in that of artificials, for the sake of creating a good store of humus and supplying the biological and physical needs of the soil. The ploughing-under of a clover-grass layer is highly effective on soils on which the crops show a tendency to foot rot. 'Mellowness' of tilth should be maintained for as long a period as possible of the entire course of vegetation. The correct adjustment of the water content of the soil is another important measure. The depth of ploughing must depend on local conditions and no hard-and-fast rules can be made concerning this factor. To sum up, any kind of soil deficiency is liable to induce blackleg foot rot.

C. herpotrichoides, on the other hand, is much more likely to flourish on an excessively rich than on a poor soil, and the measures directed against this pathogen should include the avoidance of fallow in the rotation and a judicious checking of microbiological activity in the soil.

Sprague (R.) & Fellows (H.). **Cercosporella foot rot of winter cereals.** —*U.S. Dept. of Agric. Tech. Bull.* 428, 24 pp., 6 pl., 3 figs., 1934.

This bulletin summarizes the results up to date of investigations of the serious foot rot of winter cereals, caused by *Cercosporella herpotrichoides* in certain prairie districts (chiefly on fine sandy loam soils) of Washington, Oregon, and Idaho [*R.A.M.*, x, p. 719, and preceding abstract]. Varietal resistance tests showed that many varieties of wheat, barley, and rye are susceptible, while oats were almost immune under artificial inoculation conditions; none of the local commercially important wheat varieties was found to be resistant. Resistance in a variety is usually associated with one or several of the following characters, namely, shallow-seated open crowns, sparse tillering, short and coarse straw and tough leaf sheaths, spring habit, and very late maturity. Hohenheimer and Queen Wilhelmina (Holland) wheats are good examples of very late-maturing, resistant varieties. *C. herpotrichoides* attacks the base of the tillers in early spring, either directly through the cell walls or through the stomatal openings, and forms elliptical eye spots on the leaf sheaths. It penetrates into the inner tissues intracellularly, producing lesions in the first or second basal internode, in which internal and external stromata are formed, imparting a charred appearance to the developing culms. The lesions later shrivel, and the culms may buckle and fall under the weight of the maturing head, especially in wheat. The plants attacked are not usually severely stunted, and their roots are not invaded by the fungus.

The losses caused by *C. herpotrichoides*, the importance of which varies considerably from year to year with seasonal climatic conditions, are due chiefly to reduction in the number of culms, decrease in the size of the ears and in the weight of the grain, and increased difficulty of harvesting the fallen, irregularly ripening crop. The incidence and severity of the disease may be controlled to a certain degree by crop rotation, the use of resistant varieties, the time of sowing, and appro-

priate cultural practices. Fertilizers and chemicals were found to have little value in the control of the trouble in the field.

The bulletin also contains an account of morphological, cultural, and histological studies of *C. herpotrichoides*.

MUNDKUR (B. B.). **Some preliminary feeding experiments with scabby Barley.**—*Phytopath.*, xxiv, 11, pp. 1237–1243, 1934.

This is an expanded account of the writer's feeding experiments (with R. L. Cochran) on hogs, chickens, and guinea-pigs with scab (*Gibberella saubinetii*)-infected barley grain in Iowa [*R.A.M.*, ix, p. 369], resulting in mild pathological symptoms in the first group and in loss of weight in the others.

SCHATTENBERG (H.). **Untersuchungen über das Verhalten von Sorten, Kreuzungsnachkommenschaften und Kreuzungspopulationen gegenüber verschiedenen Herkünften von Haferflugbranden.** [Investigations on the reaction of varieties, hybrid progeny, and hybrid populations to different collections of loose smuts of Oats.]—*Kühn-Archiv*, xxxvii, pp. 409–449, 9 diags., 1934.

A very comprehensive, fully tabulated account is given of the writer's researches in 1931–2 at the Halle Agricultural Institute on the reaction of certain oat varieties, hybrid progenies, and hybrid populations to 39 German and foreign collections of loose smut (*Ustilago avenae*) [*R.A.M.*, xiii, p. 364].

On the basis of the degree of infection produced on 50,790 plants belonging to the six test varieties, Eckendorf and Lischow Early, v. Lochows Yellow, Gopher, Markton, and Black Mesdag [cf. ibid., xiii, pp. 627, 761], it was possible to subdivide the 39 collections into 12 groups ranging from highly virulent to very feebly injurious. The pathogenicity of a given collection was found to bear an absolutely specific relation only to the particular variety attacked; that is to say, a strain that is weakly injurious to the majority of the varieties may severely infect a generally highly resistant variety. Black Mesdag gave evidence of immunity from all the German and foreign collections used in these trials and may thus be regarded as qualified to act as a parent in hybridization experiments. In many cases the original degree of pathogenicity of the various collections underwent considerable modifications, in the direction both of enhanced and reduced virulence, during the course of the tests, even when they were cultivated on the highly susceptible Eckendorf Early variety. This selective action of the host can hardly be associated with aggressiveness of the pathogen [cf. ibid., xiii, p. 390], since all the collections infected this variety readily, but seems to depend on other, as yet unknown, factors.

In the work of factorial analysis 145,919 F_3 plants were utilized and nine hybrid progenies, viz., 398027 (Dippes Conqueror × v. Lochows Yellow)×Markton C.I. 2053, Carsten III×Markton, v. Lochows× Markton, Red Rustproof×Carsten III, Monarch×Dippes, Gopher× Eckendorf, v. Lochows×Eckendorf, Eckendorf×Lischow, and Dippes ×Lischow, examined for the mode of inheritance of resistance. Mono-, di-, and tri-segregation ratios were all observed [cf. ibid., xiii, p. 318], the factor for resistance being dominant.

Eight immune or resistant hybrid progenies showed, when inoculated with smut collections of varying degrees of virulence, a transgression in the direction of greater susceptibility in the F_3 families. There was no corresponding transgression towards resistance among the offspring of highly susceptible parents, and it was further impossible to isolate resistant lines by selection from susceptible progeny.

The selective action of the fungus in the infection of successive hybrid progenies was demonstrated with both strongly and feebly pathogenic smut collections in F_3 offspring and populations, comprising 11,359 plants. The results corresponded to expectations, inasmuch as the proportion of infected plants declined in successive generations; and the more virulent the smut collections used in one year the lower was the incidence of infection in the next, and vice versa.

MELCHERS (L. E.) & BRUNSON (A. M.). **Effect of chemical treatments of seed Corn on stand and yield in Kansas.**—*Journ. Amer. Soc. Agron.*, xxvi, 11, pp. 909–917, 1934.

In Kansas *Gibberella saubinetii* and *Diplodia zeae* are stated to be less common on maize than *Fusarium moniliforme* [*G. moniliformis*] and certain species of *Penicillium*, *Rhizopus*, and *Aspergillus* [cf. *R.A.M.*, xiii, p. 503]. *G. moniliformis* was detected on or in the seed of 94 per cent. of all the ears and kernels tested, but it is not an active parasite and cannot therefore be used as a criterion for the success of seed treatments. In the course of five years' experiments [the results of which are discussed and tabulated] on the effects of various commercial disinfectants on maize seed-grain, no uniformly significant advantages in yield or quality of the crops were obtained and seed treatment, therefore, cannot be recommended as a standard practice under local conditions. Of much greater importance is the selection in the field of sound, well-matured seed ears from erect stalks, followed by rapid and thorough drying.

VOORHEES (R. K.). **Sclerotial rot of Corn caused by Rhizoctonia zeae, n.sp.**—*Phytopath.*, xxiv, 11, pp. 1290–1303, 7 figs., 1934.

In 1932 the writer observed at Quincy, Florida, several decayed maize ears somewhat similar to those attacked by *Diplodia zeae* or *D. macrospora*, but differing in their sour fungoid odour and in having brown sclerotia on some of the outer husks. The affected ears are shrunken and often adhere to the husks, which are covered with a salmon-pink, later dull greyish mycelium attached to the sclerotia. In severe cases the mycelium is visible on the kernels and between the kernel rows, but sometimes only the base shows external signs of infection.

The fungus proved to be a species of *Rhizoctonia* able to infect healthy maize seedlings, especially when the mycelium and sclerotia were placed in the soil round the roots or in incisions in the stalks. Soil inoculation with pure cultures reduced seedling emergence to 31 per cent., as compared with 100 per cent. in uninoculated controls. In laboratory inoculations the roots and mesocotyl were rotted and sclerotia were formed in and on them. The highest incidence of infection on the ears of plants under field conditions was obtained by inserting the inoculum in the shank or into a wound in the ear tip. The Wheatley white dent

variety was more susceptible than Cuban yellow flint corn, especially towards maturity. The kernel is apparently penetrated by the mycelium at its base, whence it passes into the endosperm and embryo.

The fungus is stated to differ from any of the species of *Rhizoctonia* previously described and is accordingly named *R. zeae* n.sp. The sclerotia usually arise from the branching and anastomosing of hyphal aggregations and measure 0·5 to 1 mm. in diameter in culture and 0·1 to 0·5 mm. on the host, usually occurring singly but sometimes conglomerated; the hyphae are 4 to 10 μ in width, hyaline at first, reddish-brown in old cultures, and salmon-pink (later grey) on the host. Cultures maintained their viability for a year. On potato-dextrose agar the minimum, optimum, and maximum temperatures for development were 11° to 14°, 33°, and 40° to 42° C., respectively; the sclerotia resisted freezing for 15 days. The optimum hydrogen-ion concentration for growth was P_H 6·8, with a minimum near P_H 2·5 and a maximum about P_H 10·0.

Van Overbeek (J.). **Die Symptome des Bormangels bei Zea mays.** [Symptoms of boron deficiency in *Zea mays*.]—*Meded. Phytopath. Lab. 'Willie Commelin Scholten'*, Baarn (Holland), xiii, pp. 29–33, 1934.

Maize plants grown in nutrient solutions without boron develop elongated, white, transparent stripes on the newly formed leaves after about a month. On transference to a solution containing boron this symptom soon disappears and normal leaves are produced. The best growth was made by plants up to four or five weeks old with 0·1 mg. of boron per l., whereas at a later period (two to three months) 1 mg. was necessary to ensure comparable development, indicating that the boron requirement increases *pari passu* with age.

Hopkins (J. C.). **Parasitism of Rhizoctonia lamellifera, Small.**—*Nature*, cxxxiv, 3395, pp. 812–813, 1934.

The author has succeeded in obtaining 100 per cent. infection in grapefruit seedlings grown aseptically in agar media and inoculated with *Rhizoctonia lamellifera* [*R.A.M.*, xii, p. 727]. Twenty-four seedlings inoculated with an isolation of the fungus from the same host were killed in nine weeks. Inoculations with *Macrophomina phaseoli* failed.

Infection by *R. lamellifera* begins at the root tip and proceeds backwards for several inches before wilting commences. Shortly afterwards the collar, stem, and leaves are successively attacked, leading to the rapid death of the plants, in which water shortage appears to be a contributory factor. A preliminary histological examination indicates that the fungus advances along the vascular system of the young root and only penetrates the cortex to form sclerotia. This is believed to be the first authentic record of the pathogenicity of *R. lamellifera*, as opposed to other members of the *R. bataticola* group [ibid., xiv, p. 80], to living plants.

Klotz (L. J.) & Fawcett (H. S.). **Valencia rind spot.**—*California Citrograph*, xx, 1, p. 4, 1 fig., 1934.

A severe breakdown of the rind of Valencia oranges was common in the summer of 1934 in southern California, especially along the coast,

following high temperatures and humidity in July. In the absence of mechanical injury the first sign of the condition was the collapse of small areas without discoloration, the process sometimes beginning with the collapse of one oil gland. The individual oil glands then turned brown or reddish, the adjoining tissues collapsed and larger areas became affected. Apparently, the rind oil escaped internally, injuring the cells adjacent to the oil glands. Where mechanical injury was present oleocellosis [*R.A.M.*, x, p. 24] sometimes preceded the breakdown. The lesions, which gradually darkened to chestnut, were usually confined to the button half, where they were most numerous on the shoulder and round the button. In the final stages they resembled one form of the water spot previously described on Navel oranges [ibid., xii, p. 690].

Susceptible Valencia oranges subjected to a fine spray of distilled water and placed in a moist chamber at 98° F. showed a similar type of breakdown after 48 hours. Further investigations are in progress.

McMartin (A.). **Locust research at Experiment Station. Experiment with Empusa grylli.**—*South African Sugar Journ.*, xviii, 11, pp. 649, 651, 1934.

Continuing his studies on the artificial cultivation of *Empusa grylli* the fungal parasite of [redwing] locusts [*Nomadacris septemfasciata*] in Natal [*R.A.M.*, xiv, p. 98], the writer observed that colonies on sterilized pieces of meat were completely overrun by bacteria in 24 hours. Grown on a medium rich in carbohydrates, on the other hand, the fungus produced the yeast-like stage previously described, bacteria being practically absent. The growth most nearly resembling that occurring on the insects in nature was obtained on sterilized potato slices; on this medium, however, the normal development was succeeded by bacterial elements which in turn were replaced by a typical *Mucor*. This phenomenon leads the author to imagine that the bacterium at a certain stage unites in some way with the *Mucor* to produce the *Empusa*. Fragments of mycelium of the *Mucor* placed on the locusts penetrate the thin parts of the skin and invade the tissues, causing death.

Ciferri (R.) & Redaelli (P.). **De la position systématique du 'Coccidioides immitis' Stiles.** [On the systematic position of *Coccidioides immitis* Stiles.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 10, pp. 373–376, 1934.

In discussing the systematic position of *Coccidioides immitis* [*R.A.M.*, xiv, pp. 100, 169] the authors, after pointing out that the main issue is whether the cells containing the so-called ascospores are asci or sporangia, adduce their reasons for regarding them as morphologically analogous to sporangia, a view which is supported by the cytological evidence. The nuclear evolution of *Coccidioides* resembles that of most of the Chytridiales. The mononucleate chlamydospores give rise by successive mitoses to the plurinucleate sporangia from which arise an indefinite but considerable number of mononucleate aplanetic zoospores; in culture these last produce plurinucleate hyphae. The cell conjugation seen in *C. immitis* [ibid., xiii, p. 635] confirms its affinity with the less highly evolved Chytridiales, e.g., *Olpidium*, while further affinities exist in the independent cellulose membrane of the sporangiospores and the

rapid disappearance from infected tissues of the mycelium, as is found also in certain parasitic Chytridiales such as *Physoderma* and *Urophlyctis*. The Coccidioidaceae and the Protomycetaceae should be regarded as parallel families deriving from the Hyphochytriaceae.

Redaelli (P.) & Ciferri (R.). **Affinité entre les agents de l'histoplasmose humaine, du farcin équin et d'une mycose spontanée des muridés.** [The affinity between the agents of human histoplasmosis, equine farcy, and a spontaneous mycosis of the Muridae.]—*Boll. Sez. Ital. della Soc. Internaz. Microbiol.*, vi, 10, pp. 377–379, 1934.

After referring to their creation of the new family Histoplasmaceae [*R.A.M.*, xiii, p. 768], which with the Nectaromycetaceae and the Torulopsidaceae [cf. ibid., xiv, p. 192] is included in the order Adelosaccharomycetaceae containing all the asporogenous yeasts, the authors state that *Histoplasma capsulatum* [*Posadasia capsulata*: ibid., xiv, p. 100], *Cryptococcus farcinimosus* [ibid., xii, p. 172], and *C. muris* (isolated by Shortt in 1923 from rats in India) share common characteristics in their elective localization, their morphological appearance, and their manner of reproduction in human and animal tissues. They also have certain cultural and biochemical characters in common and there is, further, a certain analogy between the diseases caused by them, all of which are a form of systemic, parasitic reticulo-histiocytosis. For these reasons they transfer *C. farcinimosus* and *C. muris* to the genus *Histoplasma*, the nomenclature and synonymy of the three species of which the genus at present consists being listed.

Hansmann (G. H.) & Schenken (J. R.). **A unique infection in man caused by a new yeast-like organism, a pathogenic member of the genus Sepedonium.**—*Amer. Journ. of Path.*, x, 6, pp. 731–738, 4 pl., 1934.

Full clinical details are given of a fatal case of chronic infection, apparently localized in the skin and regional lymph nodes for some fifteen years, in a middle-aged American steel-welder. The yeast-like organisms measuring 3 to 5 μ (6 μ in the lungs), isolated from the diseased tissues, produced on a number of standard media a branching, septate mycelium, large, spiculate chlamydospores, and lateral conidia contained within the hyphae. Comparative studies were carried out with this organism and a number of others presenting a similar histological appearance; the closest resemblance was to *Histoplasma capsulatum* [*Posadasia capsulata* (Darling) Moore: see preceding abstract], but no involvement of the spleen was detected in the case under investigation. For the present the fungus is classified as a species of *Sepedonium*. It proved mildly pathogenic to guinea-pigs and rabbits and virulently so to dogs and rats, being recovered from the granulomatous lesions induced in the two latter three to four weeks after inoculation.

Sutherland-Campbell (H.) & Plunkett (O. A.). **Mucor paronychia.**—*Arch. of Dermatol.*, xxx, 5, pp. 651–658, 3 figs., 1934.

In 1929 the first-named writer reported (*Arch. of Dermatol.*, xix, p. 233, 1929) the occurrence of a species of *Mucor* in the nails of persons working with oranges in California. The fungus was shown by

inoculation experiments on oranges to cause diminution of size, loss of weight, and an initial softening followed by a gradual drying out and hardening of the fruit and a change of the orange colour to yellowish-brown, a process occupying some four months. The organism was found to be capable of existing for 4½ years in a sealed tube without nutrients. It withstood the application of X-rays at doses up to seven skin units.

The *Mucor* isolated from oranges and from the workers' nails is considered to be a new species and named *M. paronychius*. It has two kinds of sporangiophores, tall and short, the former 8 to 11 μ in breadth, with short lateral branches, and the latter 10 to 15 μ, with branches of various types, sometimes circinate. The globose, white (later yellowish-brown) sporangia are 35 to 65 μ in diameter, the columellae being oval or rarely piriform, and measuring 25 to 40 by 18 to 28 μ; the pale grey spores are spherical, 4 to 6 μ in diameter, or oval, 5 to 7 by 3 to 4 μ. Hyaline chlamydospores may be produced within the sporangiophores, when they are either oval or oblong, somewhat blunted at the ends, 12 to 15 by 10 to 11 μ, or spherical, 11 to 13 μ; or in the vegetative mycelium, when they are oval or spherical, thick-walled, and 14 to 18 μ in diameter. Oidia are formed in liquid sugar-containing media and on the natural hosts of the fungus.

The fact that orange peel is not softened or digested is considered to show that the action of the fungus is inhibited by the volatile oils. This is not the case, however, with lemons, the inoculation of which with the *Mucor* is followed by a soft decay.

M. racemosus appears to be the only other species recorded both on man and on citrus fruits; it differs from the present organism in the dimensions, shape, and jet-black colour of its chlamydospores. The other allied species, *M. erectus*, *M. fragilis*, and *M. circinelloides* [ibid., viii, p. 335; ix, p. 426; x, p. 740; xi, p. 554] also present various features distinguishing them from *M. paronychius*.

Mason (J. H.) & Bekker (J. G.). **Further notes on lumpy wool in South Africa.**—*Onderstepoort Journ. Veter. Sci.*, iii, 1, pp. 211–216, 1 fig., 1934.

On blood or serum agar after 24 hours' incubation at 37° C., the hyphae of *Actinomyces dermatonomus*, the agent of 'lumpy wool' among sheep in South Africa [*R.A.M.*, xi, p. 457], measure on an average 2 to 6 by 0·5 to 1 μ and often terminate in knob-like enlargements. At a later stage (48 to 72 hours) the culture consists largely of conidia, the hyphae ending in a series of coccus-like bodies, while four to six days later smears from the culture resemble those from a pure culture of a small coccus. The cultural characters and fermentation reactions of the organism are briefly described, and observations are made on its pathogenicity to laboratory animals and sheep, and on therapeutic measures. The disease is definitely associated in South Africa with a heavy rainfall.

Macy (H.) & Steele (G. H.). **Butter as a substrate for mold growth.**—*Journ. Dairy Sci.*, xvii, 5, pp. 397–407, 1934.

In a study at St. Paul, Minnesota, on 372 mould cultures, representing 19 genera and 70 species [which are listed], besides 30 unidentified fungi,

all originally isolated from butter and the equipment used in its manufacture or packing, small blocks of sterile, unsalted butter were inoculated and stored at various temperatures to observe the effect of temperature on their growth [*R.A.M.*, xiii, p. 579].

At 22° C. over 96 per cent. of the cultures developed, *Aspergillus niger* and *Oospora lactis* [ibid., xiii, p. 511] being the chief exceptions, whereas at 5° no growth was observed after a fortnight in three species of *Aspergillus*, *Acremoniella brevis*, *Acrostalagmus cinnabarinus* [ibid., xiii, p. 769], *Monilia geophila*, *Mucor plumbeus* [ibid., x, p. 731], *Penicillium fellutatum*, and *Rhizopus speciosus*. On transference to 22°, however, most of the cultures resumed growth within a fortnight. Only two cultures gave the slightest sign of growth at — 18°, viz., *P. viridicatum* and *P. griseo-fulvum*, but here again transference to 22° was in most cases followed by renewed development.

The most serious blemishes in the appearance of the butter were caused by species of *Alternaria* (dark brown or black smudges, often involving the whole block), *Hormodendrum* (similar, sometimes dark green), *Phoma* (red, brown, green, or black), and *Stemphylium* (pink, red, or reddish-brown). The disagreeable odour imparted by the moulds was generally reminiscent of stale cheese, this effect being frequently noticeable in the absence of any visible sign of infection.

Baeza (M.). **Recherches sur les champignons produisant des altérations dans les œufs destinés à la consommation.** [Studies of the fungi that cause tainting in eggs destined for human consumption.]—*Ann. de Parasitol. Humaine et Comp.*, xii, 6, pp. 543–550, 1 fig., 1934.

The author states that bacteriological and mycological studies of 250 eggs seized as tainted at the Central Market in Paris showed that none of them contained species of *Sporotrichum* [cf. *R.A.M.*, vii, p. 638] or *Rhinocladium*, fungi to which similar troubles have been attributed in other countries. Apart from 54 entirely rotted eggs which only yielded bacteria either alone or associated with a *Fusarium*, the fungal flora isolated from the remainder consisted of species of *Hormodendrum*, *Cladosporium*, *Alternaria*, *Stemphylium*, *Penicillium*, *Chaetomium*, *Fusarium*, *Cephalosporium*, *Tilachlidium*, *Myceliophthora*, and *Zygodesmus*, all of which reproduced the decays observed when inoculated into fresh eggs and incubated at 25° to 27° C. for four to eight days. The position of the discoloration inside the eggs, as well as the fact that none of the fungi isolated grows in pure culture at 40° C., the normal temperature of hens, are considered to indicate that infection occurs after the eggs are laid.

Schmid (K.). **Untersuchungen an Böden und Pflanzen von erkrankten Sisalbeständen in Ostafrika.** [Investigations of the soil and plants from diseased Sisal stands in East Africa.]—*Die Phosphorsäure*, iv, 11, pp. 676–685, 2 figs., 1934.

A tabulated account is given of analyses made at the Hohenheim (Stuttgart) Agricultural College of physiologically diseased sisal (*Agave*) [*rigida* var. *sisalana*] plants and of soil samples from the affected areas of the Belgian Congo [*R.A.M.*, x, p. 383]. The soils were found to

contain the barest minimum of soluble phosphoric acid (less than 1 mg. per 100 gm. of soil), and the diseased plants contained only one-third of the phosphate content of healthy ones. The general poverty of the soils in other nutrients, e.g., potash and magnesium, is not considered to play much part in inducing the pathological condition of the sisal stands, which is attributed specifically to phosphorus deficiency.

Mes (Margaretha G.). **A wilt of Snapdragon (Antirrhinum majus) in South Africa.**—*South African Journ. of Sci.*, xxxi, pp. 281–287, 4 figs., 1934.

Snapdragons (*Antirrhinum majus*) in the Pretoria district and other parts of South Africa are stated to be liable to a sudden wilt involving the root system and stem base. Most of the young roots are more or less completely rotted, while the cortex of the older ones often falls away, exposing the discoloured xylem tissues. The stem base is discoloured on one side or all round, the dark, water-soaked, slightly sunken area, of a tough consistency, sometimes extending as high as the lower lateral branches.

The diseased cortical and xylem tissues contained a mycelium and numerous oogonia of a *Phytophthora*, and on placing fragments of the material in water papillate sporangia, sometimes with zoospores, developed in profusion. In almost every case of severe decay a *Fusarium* was also isolated but in the incipient stages of the disease a pure culture of the *Phytophthora* was consistently obtained. The results of inoculation experiments [details of which are given] with each of these organisms separately and together showed conclusively that the *Phytophthora* is the agent of the wilt, the *Fusarium* being purely secondary; its only additional effect appears to be the production of a purple to reddish discoloration often noticed in the diseased tissues. The *Phytophthora* survived throughout the summer (October 1933 to April 1934) in completely air-dry soil in the open.

The fungus grew readily on various media, forming sporangia and oogonia after about eight days. The ovate or piriform, papillate sporangia measure 26 to 88 by 18 to 37 μ, with varying averages in different cultures of 42 by 25 μ, 45 by 27 μ, and 49 by 33 μ. Germination frequently occurs by one or more apical or occasionally basal germ-tubes; in other cases at least 30 slightly piriform zoospores, measuring about 10 μ, were liberated from each sporangium. The smooth, spherical to subspherical oogonia, usually having a broad, funnel-shaped base, measure 18 to 28 μ with an average of 23 μ. The oospores are thick-walled (2 to 3 μ), yellowish to yellow-brown, and the antheridia nearly always paragynous. In these particulars the fungus corresponds fairly closely with *P. pini* var. *antirrhini*, the agent of a foot rot and wilt of *A. majus* in India [ibid., viii, p. 243], which is included by Tucker under *P. cactorum* [ibid., x, p. 755]. The South African organism is therefore referred to *P. cactorum* [ibid., xiii, p. 784], also reported as the cause of a similar snapdragon disease in California [ibid., xiii, p. 581].

From the temperature relations of *P. cactorum* the wilt might be expected to reach a climax in hot weather, and such is in fact the case in the Pretoria district, where the most severe outbreaks occur in

November. The addition of naphthalene to the soil was found by one grower to prevent the occurrence of the wilt, and control experiments along this line are in progress.

CHITTENDEN (F. J.). **Antirrhinum rust: a plea.**—*Journ. Roy. Hort. Soc.*, lix, 5, pp. 450–451, 1934.

After briefly recapitulating the facts relating to the sudden outbreak of snapdragon (*Antirrhinum majus*) rust [*Puccinia antirrhini*], previously known only in the United States and Bermuda, in England in 1933 [*R.A.M.*, xiii, p. 771], the writer advances an urgent plea for the eradication of all snapdragon plants, even those in apparent health, during the month of November. Only by such measures will it be possible to save this very popular flower (some 7,000,000,000 seeds of which are sown annually in England) from further destruction. Infection has spread so rapidly that no part of the country can now be regarded as free, and there is little hope, at any rate for many years to come, of developing immune varieties. The results of spraying experiments have so far been disappointing, their success, according to American reports, being apparently due to certain favourable weather conditions of rare occurrence in this country.

[This paper also appears in *Gard. Chron.*, xcvi, 2499, p. 359, 1934.]

LAUBERT (R.). **Der Löwenmaulrost, ein Musterbeispiel sich rasch ausbreitender eingeschleppter Pflanzenkrankheiten.** [The Snapdragon rust, a model example of rapidly spreading imported plant diseases.]—*Die Kranke Pflanze*, xi, 11, pp. 142–143, 1934.

The latest addition to the growing number of plant diseases introduced into Germany (and in some cases into Europe) since 1900 [*R.A.M.*, xii, 578] is the snapdragon rust [*Puccinia antirrhini*: ibid., xiv, p. 172], reported (according to Dr. Poeverlein) from northern France in 1931 and from England in 1933 [see preceding abstract]. In July 1934 the rust was observed near Cologne and subsequently in a destructive form in the Mülheim and Essen districts (Rhine) [see next abstract]. The symptoms of the disease are briefly described and control measures indicated.

SOMMER (H.). **Antirrhinum-Rost jetzt auch in Deutschland.** [*Antirrhinum* rust now also in Germany.]—*Blumen- und Pflanzenbau verein. mit Gartenwelt*, xxxviii, 44, p. 558, 1 fig., 1934.

Antirrhinum [*majus*] plants in the Darmstadt district of Germany were destructively attacked by *Puccinia antirrhini* [see preceding abstract] in August 1934, all being dead right down to the roots by the middle of September.

BUCHWALD (N. F.). **Løvemundrust (Puccinia antirrhini). En ny Svampesygdom i Danmark.** [Snapdragon rust (*Puccinia antirrhini*). A new fungous disease in Denmark.]—*Gartnertid.*, 1, pp. 656–657, 1934.

A popular note is given on snapdragon rust (*Puccinia antirrhini*) [see preceding abstracts], the occurrence of which in a private garden at

Vanløse constitutes a new record for Denmark. Control measures are briefly indicated.

HOWARD (F. L.). **Felicia amelloides Voss, an unreported host for Erysiphe cichoracearum DC.**—*Phytopath.*, xxiv, 11, p. 1315, 1934.

The popular blue *Agathaea* daisy (*Felicia amelloides* Voss) [*Aster rotundifolius* Thunb.] has been found to suffer fairly severe damage from powdery mildew (*Erysiphe cichoracearum*), apparently not hitherto recorded on this host, in Rhode Island. The white mycelium and conidiophores are associated with scattered patches of dark reddish-brown perithecia, each containing eight or more stipitate asci usually with two ascospores. The haustoria are simple. The infected foliage shrivelled, died prematurely, and fell.

VAN LUIJK (A.). **Untersuchungen über Krankheiten der Gräser.** [Investigations on grass diseases.]—*Meded. Phytopath. Lab. 'Willie Commelin Scholten'*, Baarn (Holland), xiii, pp. 1–22, 2 pl., 1934.

The pathological conditions of lawns and golf greens known in the United States as 'large brown patch' and 'small brown patch' are stated to be prevalent also in Holland [*R.A.M.*, xiv, p. 12]. Of the various parasitic fungi isolated from the affected turf (mostly *Festuca duriuscula* and *Agrostis stolonifera*) the following were the most frequent: *Pythium irregulare*, *P. de Baryanum*, *P. mamillatum* [ibid., x, p. 487], *P. torulosum* Coker & Patterson (some details of the morphology of which are given), *P. volutum* Vanterpool & Truscott, *Rhizoctonia* [*Corticium*] *solani*, and species of *Sclerotium*, *Helminthosporium*, and *Fusarium*. The two last and a virulent form of *C. solani* were also isolated from grass seeds.

From the results [which are fully described and tabulated] of inoculation experiments under controlled conditions with a number of the above-mentioned organisms, it is apparent that all the species of *Pythium* except *P. torulosum* (which rather exerted a stimulatory effect) are more or less virulent parasites of the grasses under observation and also of *Lolium annuum* var. *westerwoldicum*, in their younger stages. The pathogenicity of *C. solani* was more pronounced at greenhouse temperatures (24° to 32° C.) than at room temperature, but the reverse was the case with the species of *Sclerotium* isolated.

In a series of inoculation experiments with the grass parasites on sterilized seed, germination was slower in the treated material in sterile soil; under certain conditions, however, not yet fully understood, the presence of saprophytic fungi in unsterilized soil seems to stimulate the growth both of plants and pathogens.

TOMSON (R.). **Ristikuvähk ja teised Ristiku haigused Eestis.** [Stem rot and other diseases of Clovers in Esthonia.]—Reprinted from '*Agronoomia*', Tartu [Dorpat], *1934*, 8–9, 24 pp., 10 figs., 1934. [German summary.]

In this paper an account is given of the chief fungal diseases that have been described on clovers [*R.A.M.*, ix, p. 787], among which the following are stated to have been recorded in Esthonia: stem rot

(*Sclerotinia trifoliorum*), anthracnose (*Gloeosporium caulivorum*) [*Kabatiella caulivora*], *Uromyces trifolii-repentis* [ibid., viii, p. 604], *U. minor* [ibid., vi, p. 684], *Peronospora trifoliorum*, *P. trifolii hybridi* Gäum., *Phyllachora* [*Dothidella*] *trifolii* [ibid., ii, p. 546; iv, p. 96], *Pseudopeziza trifolii* [ibid., i, p. 422], and *Erysiphe martii* [*E. polygoni*: ibid., xii, p. 615].

Buchholtz (W. F.). **The rôle of damping-off diseases in relation to failures of Alfalfa stands on some acid soils.**—*Science*, N.S., lxxx, 2083, p. 503, 1934.

A fungus, believed to be a species of *Pythium* [cf. *R.A.M.*, iv, p. 654], was isolated in 1933 from the collapsed tissues of lucerne seedlings growing on acid soils in Iowa, the damping-off percentages on three types of which were 41, 48, and 16, respectively, compared with only 7 and 6, respectively, on two neutral soils. In the germination and emergence stages the invasion of the seedlings is so rapid that complete collapse and general necrosis take place within 24 hours, while local lesions may be produced on the hypocotyls and primary roots at any time until the plants are fully established. The organism was inoculated into lucerne seedlings grown in sterile soil with positive results. A higher percentage of healthy seedlings developed in acid soil steamed for two hours at 15 lb. or disinfected with 0·5 per cent. formaldehyde than in untreated soil, while some evidence was forthcoming that damping-off may be combated in acid soil by limestone and hydrated lime. Less infection occurred on seedlings in pots of acid soil at 9° than at 20° to 25° C.

Rudloff (C. F.) & Schmidt (M.). **Venturia inaequalis (Cooke) Aderh. II. Zur Züchtung schorfwiderstandsfähiger Apfelsorten.** [*Venturia inaequalis* (Cooke) Aderh. II. On the breeding of scab-resistant Apple varieties.]—*Der Züchter*, vi, 11–12, pp. 288–294, 3 figs., 1 diag., 1934.

Experiments are in progress at the Kaiser Wilhelm Plant Breeding Institute, Müncheberg, Mark Brandenburg, to develop apple varieties combining desirable commercial qualities (especially as regards size and flavour of the fruit) with resistance to scab (*Venturia inaequalis*), the annual losses from which in German orchards are estimated at M.40,000,000 to 60,000,000. The fact that none of the standard apple varieties possesses any conspicuous degree of resistance led to observations in 1933–4 on ten species of *Malus* [*Pyrus*: cf. *R.A.M.*, xiii, p. 383], among which *P. atropurpurea* and *P. micromalus* remained free from infection in both years, while *P. spectabilis* and *P. zumi* were only mildly attacked in 1933 and showed no sign of disease in 1934. On the other hand, *P. baccata* proved highly susceptible and *P. scheideckeri* also suffered severely in both years. In a series of controlled tests, using a method of intensive inoculation [details of which are given] with conidial suspensions of the fungus, 20 out of 22 cultivated apple varieties developed scab, the exceptions being Antonowka and Ernst Bosch, as also did *P. hislop* and *P. prunifolia*, while *P. arnoldiana* remained healthy. The incubation period ranged from 13 to 29 days. In a further extensive series of inoculation experiments in 1934 on seedlings of species, varieties, interspecific, and intervarietal crosses,

promising results were obtained, e.g., in crosses between Ernst Bosch and (1) *P. baccata* var. *himalaica* and (2) *P. niedzwetzkyana* (62·3 and 43·6 per cent., respectively, of the seedlings free from infection). The segregation of types with larger fruits than the wild parent was observed in the F_1 progeny of a cross between *P. zumi* and Yellow Bellefleur, and altogether there is considered to be every hope that this line of research may be profitably pursued.

The data obtained in these investigations do not warrant the conclusion that the extreme morphological divergences in monospore cultures of *V. inaequalis* from different apple varieties are accompanied by any strict degree of physiologic specialization [ibid., x, p. 464].

KENT (W. G.). **A commercial Apple-spraying demonstration in 1933.**—*Journ. Min. Agric.*, xli, 8, pp. 733–742, 1934.

The spraying experiments in 1933 in the same apple orchard as in 1932 [*R.A.M.*, xiii, p. 105] gave, in the plots that were sprayed four times (10th and 18th April, 10th and 22nd May) with Bordeaux mixture of the same composition as in the previous year, an increase in the percentage of apples free from scab [*Venturia inaequalis*] ranging from 76·7 to 77·5 (92·8 and 90·6 per cent. clean apples as compared with 16·1 and 13·1 per cent. in the controls), while in the plots sprayed with lime-sulphur (1·2 in 40 galls., subsequently diluted to 1 in 80 and 1 in 100, lead arsenate being added only to the first spray) the percentage of clean apples was increased by from 60·8 to 64. The total cost of the sprayings (£13 17*s.* 7*d.*) worked out at £2 8*s.* 10*d.* per acre, as against £3 4*s.* 7*d.* in 1932, the reduction being due chiefly to the omission of the spreader with lime-sulphur and of the lead arsenate in the second spray, and also to the fact that in 1933 the labour cost 2*s.* 0½*d.* per 100 galls. as against 3*s.* 0¼*d.* in 1932. In 1933 all the sprayings were made through large-capacity nozzles, whereas in the previous year the nozzles for the first spraying were of small capacity and were progressively increased subsequently.

MITRA (A.). **Apple rot caused by Fusarium moniliforme Sheldon.**—*Current Science*, iii, 5, pp. 202–203, 1 fig., 1934.

When pure cultures of *Fusarium moniliforme* [*Gibberella moniliformis*] occurring as a saprophyte in India were inoculated into apples which were then kept for 35 days at 19·5° to 22·8° C. a rot resulted which destroyed 22 per cent. of the flesh in the period. This is thought to be the first record of *G. moniliformis* as parasitic on apples. Negative results were given by inoculations with *F. camptoceras*, *F. semitectum*, *F. semitectum* var. *majus*, and *F. diversisporum*.

CARNE (W. M.) & MARTIN (D.). **Apple investigations in Tasmania: miscellaneous notes.**—*Journ. Australian Council Sci. & Indus. Res.*, vii, 4, pp. 203–214, 1934.

After discussing the theory recently propounded by Atanasoff that bitter pit of apples, including the various manifestations termed drought spot, cork, crinkle, &c., is a virus disease [*R.A.M.*, xiii, p. 707] and adducing reasons which lead them to regard it as untenable, the authors state that crinkle is one of several non-parasitic disorders of apples collectively known as cork, and that water-core [ibid., x, p. 115]

is an essential prerequisite to it. Experience in Western Australia and Tasmania has shown that in the more susceptible apple varieties visible crinkle generally occurs 10 to 14 days after a heat wave in January or February, heat and drought being conditions known to conduce to the development of water-core. The first stage in the production of crinkle from water-core involving most of the flesh is the browning of the injected tissues close to the skin. This area then dies and dries out. Cavities form in the dead tissue and the overlying surface of the apple collapses in an inward direction.

Emphasis is laid on the association of water-core with breakdown which has been observed by the writers in fruit on the tree as well as in cool storage and on the market. The three main types of water-core breakdown observed in Australia and Tasmania as well as in Australian apples in London are described. These are (1) radial (also known as inherent breakdown), (2) breakdown of the deep scald type, and (3) early water-core type found particularly in the French Crab variety in Tasmania in 1934.

PLAGGE (H. H.). **The storage behaviour of Apples as influenced by nitrogen fertilization and storage temperature.**—*Iowa State Coll. Journ. of Sci.*, ix, 1, pp. 95–114, 4 graphs, 1934.

This is a summarized account of investigations from 1929 to 1931, inclusive, carried out on Grimes and Jonathan apples in Iowa to determine the possible existence of a causal relationship between the nitrogen content of the fruit, as influenced by nitrogen fertilization of the trees, and susceptibility to soggy [low temperature] breakdown [*R.A.M.*, xiv, p. 41]. The [tabulated] results indicated that in 1929, when the growing season was about normally wet, susceptibility to the breakdown was apparently increased by applications of sodium nitrate, while in the two following years, which were dry, little breakdown occurred and no significant differences were noted in the susceptibility of the fruit from the various plots. Nitrogen content (especially in the non-colloidal form) was apparently increased in the apples from trees that had received applications of nitrate fertilizer the same year or the preceding one, but not in the third year after application. Susceptibility to soggy breakdown, however, was not apparently increased by increase in the total nitrogen content of the apples. In general, but not always consistently, the sodium nitrate applications slightly reduced the total sugar content of the fruit, but the results of storage tests indicated that sugar content at the time of storage cannot be used as a criterion of susceptibility to breakdown. The most marked changes during storage, especially at the higher temperatures (48° to 50° F.), were in sucrose content, which reached a very low level in some apples from the nitrated trees; the ratios of sucrose to total nitrogen or to either the non-colloidal or colloidal nitrogen fractions determined on the date of picking did not appear to be correlated with susceptibility to the breakdown. On the other hand the ratio of reducing sugar (which was found to be more stable during storage) to non-colloidal nitrogen content was consistently higher in fruit of both varieties from the untreated than from the nitrated plots throughout the three years of the experiments,

and this is possibly one explanation for the greater resistance to breakdown of the apples from the control trees. Another is the fact that fruit from the latter consistently gave a higher yield in alcohol-insoluble residue after complete starch hydrolysis during storage, suggesting that such fruit differentiates more cell walls than the apples from nitrated trees.

McCallan (S. E. A.) & Wilcoxon (F.). **Fungicidal action and the periodic system of the elements.**—*Contrib. Boyce Thompson Inst.*, vi, 4, pp. 479–500, 1 fig., 1 graph, 5 diags., 1934.

This is a briefly annotated report of the results obtained by the authors in their investigation of the toxicity to the conidia of *Sclerotinia americana*, *Botrytis paeoniae*, *Pestalotia* [*Pestalozzia*] *stellata*, and the uredospores of *Uromyces caryophyllinus* of compounds of a large number of elements in relationship to the position of the latter in the periodic system, the measure of toxicity used being the concentration of the toxic agent permitting the germination of 50 per cent. of the spores (LD (lethal dose) 50). In general, it was found that within a group of elements the toxicity increased with the atomic weight, and also tended to increase towards the centre of the periodic table of the elements in that group and to decrease towards both ends of it. Compounds of the more positive elements exhibited practically the same toxicity, independently of the particular compound tested, but in the case of the more negative elements, toxicity varied widely with the particular type of compound used. All the volatile hydrides tried were highly toxic, while the most highly oxidized forms showed little or no toxicity. A marked tendency was observed for a given element toxic to one fungus to be also toxic to the others, but this correlation was by no means general. Compounds of osmium and silver were the most toxic, and a number of elements were found to have compounds of higher toxicity than those of copper. The investigation showed that, in addition to mercury and copper, the elements which may find wider application as fungicides are cerium, cadmium, lead, thallium, chromium, and arsenic.

Rolet (A.). **Le sulfate de cuivre qui tombe sur le sol des vignobles.** [The copper sulphate that falls on vineyard soils.]—*La Vie Agric. et Rurale*, xxiii, 46, pp. 345–346, 1934.

It has been estimated that the 6,000 hect. of vineyard soil in the canton of Vaud, Switzerland, absorbed during the period from 1886 to 1906 some 1,560,000 kg. of metallic copper from the treatment of the vines against [downy] mildew [*Plasmopara viticola*] with Bordeaux mixture. Investigations at the Saône-et-Loire (France) Agricultural Station have shown that the process of nitrification is not sensibly impeded by the accumulation of copper sulphate, presumably on account of the insoluble form assumed by the salts on contact with the carbonate of lime, ferric oxide, and aluminium in the soil. For the most part, moreover, the copper in alkaline mixtures is already insoluble on reaching the soil, so that no detrimental effects from its liberal application as a fungicide need be feared.

Bordas (J.). **Action de l'urée sur les suspensions colloïdales.** [The action of urea on colloidal suspensions.]—*Comptes rendus Acad. d'Agric. de France*, xx, 23, pp. 777–780, 1934.

A valuable enhancement of the stability of fungicidal colloidal suspensions of copper or sulphur, with or without resin (50 gm. in ¼l. denatured alcohol per 100 l.), was obtained by the addition of some 2 l. per 100 l. of a 20 per cent. solution of pure urea.

Naoumoff (N. A.). Болезни садовых и овощных растений с основами общей фитопатологии. [Diseases of orchard and kitchen-garden plants, with the elements of general phytopathology.]—2nd. ed., 344 pp., 83 figs., 2 graphs, 7 maps, Госуд. Издат. Колхозной и Совхозной Литер. „Сельхозгиз" [State Publishing Office 'Selkhozgiz'], Moscow, 1934.

The author prefaces this book with the statement that it is compiled on much the same lines as the first edition [*R.A.M.*, xi, p. 255], with additions to bring it up to date, especially as regards the control of the diseases dealt with. The sixteen pages of bibliography appended give references almost exclusively to works published during recent years, not included in the first edition.

Blackburn (Kathleen B.). **Wasting disease of Zostera marina.**—*Nature*, cxxxiv, 3393, p. 738, 1 fig., 1934.

The author's studies of the chromosomes of the narrow-leaved form of *Zostera* which has in certain localities replaced *Z. marina* destroyed by the wasting disease [*R.A.M.*, xiv, p. 50] lend little or no support to the view that this form is a hybrid between *Z. marina* and *Z. nana*. The chromosomes of the narrow-leaved form (*Z. marina* var. *angustifolia*) agree with those of *Z. marina*, of which it is suggested it may be an ecological form.

Chester (K. S.). **Specific quantitative neutralization of the viruses of Tobacco mosaic, Tobacco ring spot, and Cucumber mosaic by immune sera.**—*Phytopath.*, xxiv, 11, pp. 1180–1202, 10 figs., 1934.

By means of a specially evolved technique [full details of which are given] the writer investigated the capacity of the viruses of tobacco mosaic and ring spot and cucumber mosaic [*R.A.M.*, xiv, p. 5] to induce in rabbits the production of neutralizing antibodies [cf. ibid., xiv, p. 197].

Normal rabbit serum was found to inhibit virus infectivity through decreasing the susceptibility of the host plants (Early Golden Cluster beans [*Phaseolus vulgaris*] and occasionally *Nicotiana glutinosa* for tobacco mosaic and Black Eye cowpeas for ring spot and cucumber mosaic) and not through an effect on the virus. This property is shared by other non-specific proteinaceous substances, such as healthy tobacco extract, ovalbumin, and milk. Virus-immune serum, in addition to producing the same non-specific effect on the host as normal serum, further exerts a specific neutralizing action on the virus used in immunization. The host-inhibitory effect of normal serum, however, is independent of time *in vitro*, whereas the process of virus neutralization by immune serum requires a certain incubation period of the serum-virus mixture to become effective; it is probably accomplished to a great extent in 10 to 15 minutes at room temperature.

Neutralization of the tobacco mosaic virus follows a law of multiple proportions: if the amount of virus be increased by a given percentage, the quantity of immune serum added must be increased by the same percentage in order to produce a comparable inhibitory effect. An absolute cross-specificity was demonstrated in the neutralization of the three viruses tested, each of which is completely neutralized exclusively by its homologous serum, while the other two sera behave just as normal serum.

These experimental results are considered to show that the reaction is a specific, quantitative neutralization of virus by immune serum, a phenomenon not hitherto reported in connexion with plant viruses.

In preliminary experiments on strains of the viruses under consideration it was found that the yellow and green strains of cucumber mosaic are closely related serologically, while the former is wholly unrelated to a superficially indistinguishable yellow strain of tobacco mosaic.

Smith (K. M.) & Dufrénoy (J.). **Sur le virus Y des Solanées.** [On the Y virus of the Solanaceae.]—*Comptes rendus Acad. des Sciences*, cxcix, 21, pp. 1147–1150, 2 figs., 1934.

The first-named writer has previously shown that the severe symptom complex known as 'crinkle' ('frisolée') is induced in potatoes by the interaction of the X and Y viruses [*R.A.M.*, xi, p. 394; cf. also xiv, p. 185]. Aphids (*Myzus persicae*) fed on a Solanaceous plant infected by these two viruses acquire the capacity to transmit Y independently of X to other members of the same family, especially tobacco.

On certain potato and tobacco varieties the Y virus produced necrotic or dark green bands, respectively, along the leaf veins, manifestations giving rise to the American name of 'veinbanding'. The thickened, dark green bands on tobacco leaves are composed of abnormally elongated palisade cells while the cells of the spongy parenchyma are more numerous and closer together than in healthy areas. The chloroplasts are relatively well supplied with starch but deficient in fat. The chloroplasts of affected leaves, detached from the stems and allowed to wither gradually, preserve their green colour, instead of turning yellow during the process of fatty degeneration as in normal tissues. As in the case of infection by the so-called 'tobacco' viruses, the mitochondria in tobacco leaves invaded by the Y virus show a tendency to a 'honeycomb' arrangement in files along the cytoplasmic trabeculae round small vacuolar agglomerations. This cytoplasmic network stains vividly and many of the cells are found to contain striate inclusions apparently consisting of bundles of tyrosine crystals.

These cytological data may be interpreted as indicating that the Y infective principle, like other members of the virus group, tends to retard the synthesis of the cytoplasmic complexes and thereby to induce the accumulation of amino-acids.

Storey (H. H.). **The photodynamic action of methylene blue on the virus of a plant disease.**—*Ann. of Appl. Biol.*, xxi, 4, pp. 588–589, 1934.

The results of the author's experiments very briefly described in this note are interpreted to indicate that the virus of maize streak [*R.A.M.*,

xiv, p. 146] is inactivated by adding to it sufficient methylene blue ('medicinale' of Meister Lucius and Brüning) and then irradiating the mixture for 3 to 4½ hours in diffused daylight at an open window [ibid., xiv, p. 186]. The virus agent was not inactivated, on the other hand, when the virus plus methylene blue mixture prepared in a dark room was kept for a similar period in total darkness, or when the virus fluid alone was irradiated as in the first series. These results are correlated with recent work by Perdrau and Todd [loc. cit.] on animal viruses as well as on certain races of bacteriophage.

Jahn (E.). **Die peritrophe Mykorrhiza.** [Peritrophic mycorrhiza.]—*Ber. Deutsch. Bot. Gesellsch.*, lii, 8, pp. 463–474, 3 graphs, 1934.

As a result of his investigations at Hann.-Münden, the author distinguishes three types of mycorrhiza, endo-, ecto-, and peritrophic, the latter including not only external fungi having a more or less close relationship with the root, but also accompanying saprophytes that merely occupy the space around the root and between it and the soil (the rhizosphere). These peritrophic mycorrhizal fungi do not penetrate the root but the author considers that they have a symbiotic function. Thus, in Freisleben's recent experiments with *Vaccinium* spp., growth was stimulated, not only by the addition to the cultures of the associated endophyte, but also by that of any one of several common soil moulds [*R.A.M.*, xiii, p. 794]. The provision of a zone of high acidity appears to be the physiological province of the peritrophic mycorrhizal fungi, which consist largely of Mucorineae and *Penicillium* spp. Some of these organisms, e.g., certain strains of *Mucor racemosus* and *M. ramannianus* [ibid., xii, p. 191; xiii, p. 484, *et passim*], appear in fact to be confined to the peritrophic layer of the rhizosphere. *Polyporus* [*Fomes*] *annosus* [ibid., xiii, p. 738] is known to occur in a particularly destructive manner on trees in former arable soil, its marked capacity for acidification presumably enabling it to join the other peritrophic occupants of the rhizosphere and thus to reach and penetrate the root tissues.

Molliard (M.). **Bruyères et mycorhizes.** [Heaths and mycorrhiza.]—*Comptes rendus Acad. des Sciences*, cxcix, 19, pp. 900–902, 1934.

Sterilized *Calluna vulgaris* seeds sown in sterilized heath soil in tubes germinated equally well with those in unsterilized soil but the resultant seedlings in the former lot made poor growth and turned red whereas those of the latter series developed quite normally. It would have been natural to conclude that the presence of endophytes in the unsterilized series stimulated the growth of the plants [cf. preceding abstract], but these organisms could not be detected with certainty in the radicles and a different explanation had therefore to be sought. Soil sterilized at 120° C. undergoes, in the presence of a certain amount of water, physical and possibly also chemical alterations, becoming very compact and tending to coagulate in such a way as to offer little chance of penetration by the fine radicles of *C. vulgaris*. An attempt was therefore made to develop a culture medium partaking as nearly as possible of the chemical nature of heath soil and having a physical structure suitable for *Calluna* growth. To this end tubes were filled with the filtered product of a two to three days' suspension of heath soil in an equal

quantity of distilled water, a portion of the inner tube wall being covered with a thick layer of hydrophilic cotton-wool. After one hour's sterilization at 120° the seeds were sown on the cotton at different levels in relation to the water in the bottom of the tube. Germination was particularly profuse in the absence of any mineral or organic admixture, and the development of the seedlings was the more satisfactory the closer they were to the liquid reserve in the lower part of the tube. At a distance from the water the above-mentioned arrest of growth and reddish coloration were evident, whereas the plants receiving a sufficient moisture supply assumed a perfectly natural aspect, producing an abundance of bright green foliage and attaining a height of 6 to 8 cm. during the period from January to October.

It is apparent from these results that *C. vulgaris* can develop normally on cotton soaked in sterilized heath water as described above, so that any intervention in its growth by the micro-organisms occurring in natural heath soil must be of an indirect order (possibly creating a favourable nutritional environment) rather than in the nature of an intimate obligatory association.

Van der Pijl (L.). **Die Mycorrhiza von Burmannia und Epirrhizanthes und die Fortpflanzung ihres Endophyten.** [The mycorrhiza of *Burmannia* and *Epirrhizanthes* and the reproduction of their endophyte.]—*Rec. Trav. Bot. Néerlandais,* xxxi, 3–4, pp. 761–779, 14 figs., 1934.

A description is given of the Phycomycetoid mycorrhizal fungus [*R.A.M.*, xii, p. 309] occurring in the roots of the Javanese saprophytic plants, *Burmannia candida* and *Epirrhizanthes elongata.* In both cases the endophyte is provided with typical globular, piriform, or irregular vesicles, 30 to 60 μ in diameter, but no arbuscles (sporangioles) were observed, these being replaced by coils of hyphae somewhat resembling those formed in the Orchidaceae, though less dense.

Some of the vesicles, which are not cut off by a septum from the parent hypha, develop into *Synchytrium*-like sporangia containing up to 1,000 spores, the further fate of which was not followed. Others are believed to be oogonia, and a fertilization is suggested by cases in which two nuclei in contact remain in the centre of the vesicle while the others collect at the periphery, as in certain Phycomycetes. This assumed fertilization, however, was not actually observed and neither antheridia nor oospores were found.

Though the chitinous wall of the vesicle suggests relationships with other groups (Zygomycetes), the general characters of the mycorrhizal fungus of *B. candida* and *E. elongata* are considered to place it in the Oomycetes near the Peronosporaceae.

Weindling (R.). **Studies on a lethal principle effective in the parasitic action of Trichoderma lignorum on Rhizoctonia solani and other soil fungi.**—*Phytopath.*, xxiv, 11, pp. 1153–1179, 1 fig., 5 graphs, 1934.

Some of the aspects of the writer's studies on the lethal principle on which the pathogenicity of pigmented cultures of *Trichoderma lignorum* to the citrus strain of *Rhizoctonia* [*Corticium*] *solani* and other soil fungi depends have already been summarized [*R.A.M.*, xiv, p. 188].

Uniform methods have been devised for the extraction and evaluation of the lethal principle. The lethal effects of various toxic solutions are compared by means of the so-called 'lethal index', represented by the reciprocal of the minimum concentration at which the hyphae of *C. solani* are killed. The approximate production curve of the lethal principle during the life-cycle of *T. lignorum* indicates that it is excreted into the surrounding medium by young hyphae only, the maximum amount being developed two days after spore germination, at which time also the parasitic action of the fungus on the soil organisms reaches a climax. The toxicity of the filtrate is greatly reduced by adsorption on substances such as animal charcoal and the toxic agent is rapidly decomposed at room temperature. It is greatly weakened by boiling but not entirely destroyed even by prolonged autoclaving. The lethal effects of the agent were found to decline with an increase in the hydrogen-ion concentration of the medium which induces rapid deterioration under aerobic conditions.

T. lignorum has further been shown to be capable of parasitizing *R. bataticola* [*Macrophomina phaseoli*] and *Armillaria mellea*.

Schultz (H.). **Über das Auftreten der echten Mehltaupilze.** [On the occurrence of the true mildew fungi.]—*Blumen- und Pflanzenbau verein. mit Gartenwelt*, xxxviii, 44, pp. 553–554, 1934.

While in general, fungous diseases of horticultural plants were conspicuous by their absence during the prolonged summer drought of 1934 in Germany, the powdery mildews [Erysiphaceae] formed an exception. Popular notes are given on the characters and control of some of these diseases.

Harrison (J. W.). **Thermogenesis in hay-inhabiting fungi.**—*Iowa State Coll. Journ. of Sci.*, ix, 1, pp. 37–60, 1 fig., 14 graphs, 1934.

Details are given of cultural experiments with 14 common hay-inhabiting fungi in the State of Iowa, the results of which showed that the optimum temperatures for growth of the different organisms were 15° to 20° C. for *Hormodendrum nigrescens* and *Penicillium humicola*; 25° for *Rhizopus nigricans*, *P. oxalicum*, and *Alternaria humicola*; 30° to 35° for *Aspergillus flavus*, *A. terreus*, *A. clavatus*, *A. niger*, *R. tritici*, *Mucor abundans*, *Spicaria divaricata*, and *Cunninghamella elegans*; and 40° for *A. fumigatus*. All the fungi tested were shown to be more or less thermogenic when incubated on sterile lucerne hay, with the exception of *A. fumigatus*, *A. clavatus*, *P. humicola*, *S. divaricata*, and *Alternaria humicola*, which developed little or no heat under the conditions of the experiments. Periods of rapid accumulation of heat coincided with periods of active germination and growth of the same organisms in culture. Carbon dioxide production was not a measure of thermogenesis.

Das Gupta (S. N.). **Studies in the genera Cytosporina, Phomopsis, and Diaporthe. VI. On the conversion of one strain of Diaporthe perniciosa into another.**—*Phil. Trans. Roy. Soc. London*, Ser. B, ccxxiii, pp. 121–161, 4 pl., 10 figs., 5 graphs, 1934.

A detailed study [the results of which are tabulated] of the relationship between the strains DH_C and DH_F of *Diaporthe perniciosa* [*R.A.M.*, ix, p. 50] showed that on the standard medium used, cultures of the

former had a diffuse, irregular margin and spread rather slowly, while those of the latter were compact and spread more quickly. Large inocula (1 cu. mm.) of relatively young mycelium of DH_C cultures of any size developed as DH_C, whereas similar inocula from older parts of DH_C cultures of over 15 mm. radius grew as DH_F. A large proportion of minute inocula from all parts of a comparatively young DH_C culture developed as DH_F. It was established that DH_C and DH_F may develop, respectively, from two branches of the same hypha or successive portions of one branch. It is concluded that a DH_C culture contains the properties of DH_C and DH_F and that the influence of DH_C on any part of the culture decreases with age. Apparently, the properties of the two strains are distributed generally throughout a DH_C mycelium and are present together in a single hypha, in which, however, they may be spatially separated, since the smaller the hyphal fragment used as inoculum the greater the probability that DH_F will appear.

A young DH_C mycelium is able to convert a culture of DH_F into DH_C, as all inocula composed of DH_C mixed with or in contact with an equal proportion (or more) of DH_F develop as DH_C. Established DH_F cultures not exceeding 7·5 mm. in radius when inoculated with a relatively minute fragment of DH_C at the centre or periphery assume the rate of spread and external appearance of DH_C, larger cultures being partly converted. Fusion between the hyphae of the two strains occurred under certain conditions, and it is suggested that it is as a result of fusion that DH_C is able to influence DH_F.

Diseases of Potatoes.—*Min. of Agric. and Fish. Collected Leaflets* 3, 70 pp., 3 col. pl., 27 figs., 1934.

These leaflets (collected in portfolio form) issued by the Ministry of Agriculture and Fisheries contain concise, practical notes on the symptoms, causes, and control of the principal fungal and other diseases of potatoes in England, a section also being devoted to the less important diseases. The text is illustrated with useful plates designed to facilitate diagnosis.

Ducomet (V.) & Diehl (R.). **La culture en montagne et les maladies de dégénerescence de la Pomme de terre.** [Mountain cultivation and degeneration diseases of the Potato.]—*Ann. Agron.*, iv, 3, pp. 355–372, 1 fig., 1 graph, 1934.

In this expanded account, in which full details are given, of their comparative observations on the yield and susceptibility to degeneration diseases of potato seed-tubers cut in two and the halves grown at high and low altitudes, respectively, in France [*R.A.M.*, xiii, p. 535; see also ibid., xiv, p. 77], the authors state that under the conditions prevailing during their experiments virus contamination at the higher altitude took place rather late in the season, so that medium-early and medium-late varieties such as Bintje and Institut de Beauvais to a large extent escaped attack. That the seed of these two varieties from mountain areas gave a better yield than that obtained from the plains was due not to the specifically mountain origin of the former, but to its better sanitary condition. Late varieties gave about equal yields at

both altitudes, while the very late Fin-de-Siècle × Shamrock gave definitely better yields at low than at high elevations.

VERPLANCKE (G.). **Sur une forme nouvelle de la 'bigarrure', maladie à virus filtrant de la Pomme de terre.** [On a new form of streak, a Potato disease caused by a filterable virus.]—*Bull. Soc. Roy. Bot. de Belg.*, Sér. 2, xvi, 2, pp. 107–121, 1 pl., 1 fig., 1 diag., 1934.

In 1931 a large number of Industrie potato plants imported from Poland and growing in experimental plots near Ghent developed a form of streak marked by the presence of small, pale yellow, interveinal areas, sometimes confluent, on middle-sized and full-grown leaves and by golden-yellow ones along the secondary veins of the younger leaves. Small black points quickly appeared on the spots, chiefly near where the finer veins unite with the secondary ones on leaves of average size. Visible at first only on the lower, they rapidly showed on the upper surface, while brown necrotic bands visible on both surfaces sometimes appeared on the veins and spread to the petioles and stem, the leaf edges then becoming slightly rolled backwards. Some tubers showed livid, circular, superficial spots, usually generalized but sometimes localized near the eyes; the skin over these lesions wrinkled and sometimes fell in or cracked. The affected plants matured normally, but the yield was reduced. Spread was rather rapid.

Inoculations of potatoes of different varieties as well as of other plants by rubbing and wounding the leaves with a rag dipped in the juice expressed from affected leaves and also by transferring *Myzus persicae* from diseased potatoes to healthy plants are fully described and the results listed and tabulated. Positive results by both methods were obtained on a number of potato varieties. In most instances rubbing gave rise to mosaic symptoms, while insect transmission invariably produced necrotic interveinal spots in the parenchyma and occasionally necrosis of the petiole and stem. Only Industrie tubers developed necrotic spots as a result of the inoculations. No symptoms appeared on the King Edward variety, which is probably a carrier.

The disease somewhat resembled crinkle A [*R.A.M.*, xiii, pp. 258, 464] except that *Datura stramonium* plants inoculated with the juice from the streaked plants developed only a general chlorosis and did not show the light-coloured veins characteristic of this crinkle. In some respects the disease also resembled the form of streak described by Schultz and Raleigh on British Queen potatoes [ibid., xii, p. 388], but differed from it in that the young leaves were attacked first and inoculated tobacco plants developed only a slight necrosis, whereas inoculation of tobacco with the American workers' virus is stated to have produced characteristic spotting.

It is concluded that the disease described in the present paper is a new form of streak of the same type as acropetal necrosis [ibid., xiv, p. 186].

LUNDEN (A. P.) & JØRSTAD (I.). **Investigations on the inheritance of immunity to wart disease (Synchytrium endobioticum [Schilb.] Perc.) in the Potato.**—*Journ. of Genetics*, xxix, 3, pp. 375–385, 1934.

A fully tabulated account is given of the writers' investigations at Oslo, Norway, from 1928–33, on the inheritance of immunity from

wart disease (*Synchytrium endobioticum*) in potatoes [*R.A.M.*, ix, p. 265].

The tubers were placed, rose end downwards, in glass bowls filled with moist sphagnum moss mixed with pulverized dried warts and kept in a room, for the most part in total darkness, the temperature during the winter being maintained at about 18° to 21° C. The trials usually extended from the end of November till the following summer (June to August), during which time four or five series of tubers were tested. Two or three tubers from each plant were tested, and if found free from infection, one was generally laid out again for further trial, the process being repeated if necessary until reliable results were obtained.

Susceptible varieties (e.g., Centifolia) from which seedling families were derived by self-fertilization or by crossing with another susceptible variety, such as Sagerud, Marius, and Louis Botha, yielded exclusively susceptible progeny. All the immune varieties tested (Jubel, Hindenburg, Pepo, Parnassia, Seydlitz, Flourball, and Tannenberg) and four immune individuals derived from crosses between Hindenburg and Centifolia and between Louis Botha and Jubel segregated in an approximately 3:1 immune-susceptible ratio. The crossing of immune with susceptible varieties gave variable results, segregation in some cases occurring in an approximate 1:1 immune-susceptible ratio and in others (with Jubel as the immune parent) in a proportion of 5 immune: 3 susceptible. Divergent results were further obtained in crosses between immune varieties, segregation in some cases taking place in an approximate 3:1 immune-susceptible ratio, viz., Abundance × Jubel and Helvik × Jubel; the cross Golden Lass × Flourball segregates in a rough proportion of 3:5 immune to susceptible, the corresponding ratios for the crosses Dukker × Jubel and Edzell Blue × Jubel being 7:1 and for Kerr's Pink × Jubel 15:1. The offspring of one cross between two immune varieties, Irish Cobbler × Jubel, were immune.

It is concluded that the data secured in these hybridization experiments may be interpreted as follows. X′ is a dominant factor conferring immunity independent of any other immunity factor. X″ is another dominant immunity factor, the effect of which is similar to, or identical with, that of X′. Y and Z are two complementary factors capable of producing immunity when both are present, even in a heterozygous condition, and acting independently of X′ and X″. It is assumed that all these factors are inherited independently of one another. The inferences drawn from these studies of the immunity factors and their interrelations in potato wart do not altogether agree with the conclusions reached by Salaman and Lesley in respect of the identically named factors, X, Y, and Z [ibid., iii, p. 170].

Van Schreven (D. A.). **Kalkgebrek als oorzaak van mergnecrose bij Aardappelknollen.** [Lime deficiency as the cause of medullary necrosis of Potato tubers.]—*Tijdschr. over Plantenziekten*, xl, 11, pp. 225–255, 3 pl., 1934. [English summary.]

The writer's experiments [which are fully described and the resulting data tabulated] at Wageningen indicate that, under certain conditions, potato plants may appear normal, while the tubers show severe symptoms of the condition described by Beatrice Schwarz from the Dutch

East Indies as 'rusty spot' [*R.A.M.*, vi, p. 247]. This name being considered likely to cause confusion, that of 'medullary necrosis' is substituted. The disease has been observed at Wageningen in the King Edward, Eigenheimer, Alberta, Evergood, Unicum, Triumph, Monocraat, Bravo, Thorbecke, Duke of York, and Bevelander varieties in poor, sandy, acid soils, the first-named suffering the heaviest damage and developing symptoms reminiscent of 'hollow heart' [ibid., xiii, p. 722].

A comparison is instituted between the characters of 'medullary necrosis' and that of some analogous disorders, exemplified by concentric necrosis (also known as 'kringerigheid', 'spraing', 'Kringerkrankheit', 'Kringerigheit' (Sorauer, Handbuch der Pflanzenkrankheiten, i, p. 206, 1933), 'Pfropfenbildung', and 'maladie des tâches en couronne' [*R.A.M.*, xiii, p. 650]), 'net necrosis' [ibid., xi, p. 766], and 'pseudo-net necrosis' ('erbliche [hereditary] Eisenfleckigheit' or 'necrosi pseudoreticolare') [ibid., xii, p. 319; xiii, p. 723]. Burr's opinion that spraing is due to *Bacterium rubefaciens* [ibid., viii, p. 398] is not considered to be substantiated by his photographs, which do not convey the typical impression of concentric necrosis. The cause of the latter is not known but it may be contracted by the tubers through the soil. Net necrosis is caused by the leaf roll virus [ibid., ix, p. 477; xiii, p. 797] and develops solely as a result of primary infection by grafting or by aphid (*Myzus persicae*) transmission. Pseudo-net necrosis is also due to a virus transmissible by aphids [ibid., ix, p. 483].

The fact that medullary necrosis is a disease of acid soils led the author to carry out studies on the effect of calcium deficiency on potatoes in water and glass-sand cultures. In one series of water cultures Duke of York plants grown first for 30 to 38 days in poor river sand, supplemented by the necessary nutrient elements, were then transferred to five different nutrient solutions, in three of which calcium was absent or deficient. The plants in these solutions showed no marked foliar symptoms, but developed distinct necrotic spots in the parenchyma of the tubers, though there were no external signs of these. The medullary necrosis usually began as a diffuse brown discoloration within the vascular ring at the heel end of the tuber. Tuber symptoms characteristic of medullary necrosis further developed in the President and Franschen varieties when calcium was omitted from the culture pots containing either ordinary glass-sand or the same material washed with concentrated mercuric chloride and then with tap water for at least twelve hours. These results show that, as in concentric necrosis and pseudo-net necrosis, the medullary necrosis consequent upon calcium deficiency may induce tuber symptoms without any corresponding foliar manifestations.

Miles (L. E.). **Treatment of Sweet-Potato plants for the control of black rot.**—*Phytopath.*, xxiv, 11, pp. 1227–1236, 1934.

The results [which are fully discussed and tabulated] of two years' experiments in the control of sweet potato black rot (*Ceratostomella fimbriata*) [*R.A.M.*, xiv, p. 118] in Mississippi showed that immersion of the stems and roots of plants grown for transplanting in 25 per cent. copper-lime dust or 20–20–50 Bordeaux mixture may safely be practised in cases where the period of storage and transit between lifting and

transplanting is not expected to exceed five days. No appreciable reduction in stand or yield resulted from either of these treatments.

WATANABE (T.). **Studies on the physiologic specialization in Fusarium sp. causing the stem rot of Sweet Potatoes. I. Cultural characters and the influence of temperature upon the mycelial growth. II. The influence of hydrogen-ion concentration of media upon the mycelial growth.**—*Bull. Utsunomiya Agric. Coll.*, Sect. A, i, 5, pp. 37–51; ii, 1, pp. 1–17, 3 pl., 1 graph, 1934. [Japanese, with English summary.]

The cultural characters of a species of *Fusarium* responsible for sweet potato stem rot in Japan, and the influence of temperature on its mycelial growth were studied in 40 isolations from different localities. Three types of the fungus, differing in vegetative development and sporulation could be recognized, namely, the mycelial, sporodochial, and pionnotal. As regards cultural characters eight growth types were distinguishable, while judging by temperature requirements, the 40 strains fell into three groups with optima for mycelial development at 25°, 25° to 30°, and 30° C., respectively. Both mycelial and conidial development were favoured by an alkaline reaction of the medium, but pigmentation was more abundant towards the acid side. Six growth types were differentiated, varying in their rate of mycelial development.

NISAKADO (Y.), MATSUMOTO (H.), & YAMAUTI (K.). **Comparative studies on two Rice fungi: the foot-rot-fungus in India and the 'bakanae'-fungus in Japan.**—*Ber. Ōhara Inst. Landw. Forsch.*, vi, 3, pp. 449–466, 1934.

A fully tabulated account is given of the writers' comparative studies on the fungi responsible for (*a*) foot rot of rice in India [*R.A.M.*, xii, 719] and (*b*) 'bakanae' disease of the same host in Japan (*Gibberella fujikuroi*) [ibid., xiii, p. 396; xiv, p. 120]. Two similar strains of the former from Madras and four more variable ones of the latter from various parts of Japan were used in the investigations, the results of which indicated a close agreement between the two organisms as regards the shape and size of their micro- and macroconidia and their pathogenicity to rice, but revealed a number of clear-cut physiological differences especially in the divergent colour and shape of the colonies on various culture media. No comparison of perithecial stages was made, but in a letter to the senior author S. Sundararaman stated that the Madras fungus was identified by S. F. Ashby and H. W. Wollenweber as *Fusarium moniliforme* var. *majus*, previously shown to be the conidial stage of the bakanae fungus, *Gibberella* (*Lisea*) *fujikuroi* [ibid., xii, p. 590].

RADEMACHER (B.). **Krankheitsbild und Verhalten der verschiedenen Kulturpflanzen auf urbarmachungskranken Böden.** [Pathological symptoms and reaction of the various cultivated plants on reclamation-diseased soils.]—*Deutsche Landw. Presse*, lxi, 47, p. 581; 48, p. 593, 5 figs., 1934.

In Germany the reclamation disease [*R.A.M.*, xiii, p. 323; xiv, p. 160]

is stated to occur predominantly on the swampy heath soils of Hanover, Oldenburg, and Schleswig-Holstein, being also found, however, in the Lower Rhine district, northern Westphalia, Mecklenburg, Altmark, with sporadic cases in Pomerania, East Prussia, and the Grenzmark.

The symptoms of the disturbance on various cultivated plants are briefly described. They are most conspicuous on oats, an affected field of which acquires a whitish-green shimmer giving rise to the apt local name of 'white sickness'. A prominent feature of the disorder is the continuous formation of new haulms from June onwards, even by the stubble after mowing. The black marsh oats of Rotenburg, Oldenburg, and Bremen origin, though comparatively resistant to reclamation disease, benefit to some extent by the application of copper sulphate, which has been extensively recommended against the disease.

In barley the bleaching takes a yellow rather than white tinge; the upper leaves show a marked tendency to rolling, often accompanied by marginal curling, and the ears, when formed at all, are liable to be empty. The four-rowed summer barleys suffer least from the disorder. Copper sulphate augments the yield.

Rye is usually little affected by reclamation disease, but in severe cases there may be a whitish-yellow spotting and premature shrivelling of the leaves, drooping of the ears, and scanty grain. The results of copper sulphate treatment are conflicting, but in a general way rye may safely be cultivated on 'sick' soils.

Wheat is even less well adapted than barley to cultivation on heath soils, but attempts are made here and there in north Germany to grow it. The symptoms of reclamation disease in this crop are very pronounced, the leaves being covered with longitudinal white stripes and ear formation rudimentary or absent. On soils of the type under discussion a mixture of cereals (summer rye, oats, and barley) is advocated as less liable to the disease than a single crop.

Maize generally tillers luxuriantly on heath soils but yields poorly. In pot tests the results of copper sulphate treatment were satisfactory in mild but not in severe cases of reclamation disease.

Many of the more desirable grasses, e.g. dog's tail [*Cynosurus cristatus*] appear to be gradually dying out on the soils under observation as a result of the 'white sickness', and further investigations on this aspect of the disease should be undertaken.

Copper sulphate (1 doppelzentner per hect.) has been found to produce a valuable increase in the yellow lupin [*Lupinus luteus*] and serradella [*Ornithopus sativus*] yield on sick soils.

Red clover [*Trifolium pratense*] suffers heavy damage from the reclamation disease, expressed in pallor of the leaves sometimes accompanied by a dry, brown spotting spreading inwards from the margins. The basal leaves are abnormally large while the foliar texture as a whole is flimsier than in healthy plants; flowering is scanty and late. A copper sulphate application has given increased yields.

Swedes and turnips are also liable to severe injury on heath soils, characterized by marked stunting and leaf discoloration and shrivelling, the large, yellowish-white patches spreading inwards from the margin. Copper sulphate has given promising results in this crop also.

Brandenburg (E.). **Über die Bedeutung des Kupfers für die Entwicklung einiger Pflanzen im Vergleich zu Bor und Mangan und über Kupfermangelerscheinungen.** [On the importance of copper in the development of certain plants in comparison with boron and manganese and on copper deficiency manifestations.]—*Angew. Bot.*, xvi, 6, pp. 505–509, 1934.

In this paper, which was read at a conference of the Applied Botany Society at Marburg in 1934 and followed by a discussion, the author briefly summarizes the results of his studies on the relation of copper deficiency in the soil to the reclamation disease of oats and other cereals and fodder plants (also known as 'Heidemoorkrankheit' and 'Weissseuche') [*R.A.M.*, xiii, p. 57 and preceding abstract]. In this connexion reference is also made to two analogous disorders, namely, heart and dry rot of beets [ibid., xiv, p. 73] and grey speck of oats [ibid., xiv, p. 122], the one associated with boron and the other with manganese deficiency.

Abe (T.). **Studies on a new dry-rot disease of the bulb of Crocus sativus L. caused by Fusarium bulbigenum Cke. et Mass. var. blasticola (Rostr.) Wr.**—*Trans. Tottori Soc. Agric. Sci.*, iv, 3, pp. 212–228, 2 pl., 1933. (Japanese, with English summary.) [Abs. in *Biol. Abstracts*, viii, 9, pp. 2153–2154, 1934.]

In the Kyoto district of Japan saffron (*Crocus sativus*) bulbs and roots are attacked in the field by *Fusarium bulbigenum* var. *blasticola* [*R.A.M.*, xiii, p. 261] exclusively from the end of April to the end of May, i.e., about the time of digging. Inoculation experiments with the fungus gave positive results on saffron bulbs and seedlings but not on onion seedlings. The optimum temperature for mycelial growth appeared to be near 28° C., with a minimum between 8° and 14° and a maximum above 40°. In synthetic, peptone-containing solutions the optimum hydrogen-ion concentration for the development of the fungus was P_H 3·3 to 5·6, with a potential range from 2·2 to 8. Both the incidence and severity of infection were slightly higher in arid than in humid soils, and the disease reached a climax at a soil temperature of 32°; below 20° the symptoms were negligible.

Baker (R. E. D.). **A threadblight of the Tonca Bean.**—*Trop. Agriculture*, xi, 11, pp. 293–294, 1 pl., 1934.

Tonca bean (*Dipteryx odorata*) trees in the Las Cuevos district of Trinidad were found in 1934 to be seriously attacked by a thread blight which had practically defoliated a considerable number of ten- to fifteen-year-old trees. Cultural studies of the blight at the Imperial College of Tropical Agriculture showed that in its general appearance and in its cultural reactions it was identical with the marasmioid thread blight of coffee (M_2) and the marasmioid thread blight (M_3) of grapefruit recently described by Briton-Jones and the author [*R.A.M.*, xiii, p. 540]. It appeared, however, to be somewhat exceptional in that it occurred in a fairly open field at the beginning of the wet season after a long and severe dry season, though the district where it was found is one of high rainfall, and normally high humidity. It is believed that

the disease could be controlled successfully by reducing further the humidity around the trees.

DEMANDT (E.). **Samenvatting van de resultaten der vakkenproeven van oogstjaar 1934 over verschillende onderwerpen.** [Summary of the results of plot tests during the harvest year 1934 on various lines of investigation.]—*Arch. Suikerind. Nederl.-Indië*, Deel II (*Meded. Proefstat. Java Suikerind.*), *1934*, 26, pp. 937–946, 1934.

The following item of phytopathological interest occurs in this report. Notwithstanding certain discrepancies in the statistical data, it was apparent from the results of five tests that the use of mosaic-diseased plant material of P.O.J. 2967 cane in Java adversely affects both sugar production and total yield as compared with the same variety raised from healthy setts [*R.A.M.*, xiii, p. 654; xiv, p. 191]. The maximum sugar yield of [the resistant] P.O.J. 2878 variety was intermediate between those of the two series of P.O.J. 2967. The amount of mosaic developing in the P.O.J. 2967 plots from healthy plant material ranged from 8 to 99 per cent.

SARKAR (B. N.) & DUTT (K. M.). **Effect of mosaic disease on the tonnage and the juice of Sugarcane in Patna.**—*Indian Journ. Agric. Sci.*, iv, 5, pp. 797–802, 1934.

A summarized account is given of experiments in 1933–4 at Patna, South Bihar, on the same lines as those of McRae and Subramaniam in North Bihar [*R.A.M.*, xiv, p. 191], the results of which showed that the mean emergence of shoots in mosaic-free and mosaic-infected plots of Co. 213 sugar-cane was 16·9 and 15·9 per cent., respectively, after twelve weeks, and 95·9 and 84·3 per cent. after sixteen weeks, the difference between the last two figures, due to a greater degree of tillering in the mosaic-free canes, being highly significant statistically. The mosaic-infected plots yielded 19 per cent. less in weight of stripped cane, and the calculated juice was less by 19·4 per cent., this difference being also statistically significant. The difference in brix was also in favour of the mosaic-free plots.

BOURNE (B. A.). **Some pathological observations on Sugar-Cane × Sorghum hybrids in Florida.**—*Phytopath.*, xxiv, 11, pp. 1314–1315, 1934.

In the course of a detailed two-year study in Florida on certain morphological and structural characters in 58 hybrids between the P.O.J. 2725 sugar-cane variety and Texas Seeded Ribbon sorghum, notes were made on the occurrence among them of some well-known diseases.

P.O.J. 2725 does not appear to contract mosaic in the State notwithstanding its extensive commercial cultivation and widespread exposure to infection. It is also practically immune from red rot of the sheath (*Colletotrichum falcatum*) but more or less susceptible, according to environmental conditions, to eye spot (*Helminthosporium ocellum*) [*R.A.M.*, xiv, p. 57], brown stripe (*H. stenospilum*), and brown spot (*Cercospora longipes*) [ibid., xii, p. 467]. The Texas Seeded Ribbon

sorghum variety has commonly been found infected by mosaic in close proximity to the hybrid plots, but not by any of the other leaf or sheath diseases occurring in the latter. It suffers considerably, however, from leaf rust (*Puccinia purpurea*) [ibid., x, p. 653]. Observations to date on the reaction of the progeny of the above-mentioned cross to the diseases in question indicate that some two-thirds are susceptible to the two species of *Helminthosporium*, one-third to *C. longipes*, and one-fourth to *Colletotrichum falcatum*. Neither mosaic nor leaf rust has been detected in the hybrids as yet.

OVERHOLTS (L. O.). **Mycological notes for 1933.**—*Mycologia*, xxvi, 6, pp. 502–515, 2 pl., 1 fig., 1934.

In continuation of previous notes of the same series [cf. *R.A.M.*, xiii, p. 183], the writer lists 38 species of fungi (three new) collected in the United States. Notes are given on many of these. *Ascochyta lethalis* was found causing heavy damage to *Melilotus officinalis* in Pennsylvania, this being apparently the first record for the State.

Corticium vagum Berk. & Curt. [ibid., iii, p. 741; vi, p. 125; ix, p. 739] is a common occupant of the under sides of logs of both coniferous and deciduous trees in Pennsylvania. It may be readily recognized by its fusoid or *Euglena*-shaped spores. The hyphae are 6 to 9 μ in diameter and are devoid of clamp-connexions. At times it apparently revives for two or three years in succession, and may then attain a thickness of 400 μ and show a compactness of structure contrasting with its usual thin, hypochnoid condition. There are stated to be some fifty collections of the fungus in the State herbaria.

JØRSTAD (I.). **Fungi.**—*ex* Plants of Gough Island (Diego Alvarez).—*Det. Norske Videnskaps-Akad. i Oslo, Scientific Results of the Norwegian Antarctic Expeditions 1927–1928 et sqq.*, pp. 11–12, 1 fig., 1934.

Besides describing *Puccinia goughensis* n.sp. [with a Latin diagnosis] on *Apium goughense*, the author has found a *Septoria* on the same host from Gough Island (Antarctic) agreeing with the description of *S. apiicola* Speg. from Tierra del Fuego. On comparing this with the *Septoria* on celery in Norway, it was found to resemble closely the form producing large spots [*R.A.M.*, xiii, p. 559], referred by recent workers to *S. apii* Chester, and it is concluded that the latter name is a synonym of *S. apiicola*.

HOTSON (J. W.). **Key to the rusts of the Pacific Northwest.**—*Univ. of Washington Publ. in Biol.*, iii, 193 pp., 39 figs., 1934.

This annotated monograph lists all the rusts (Uredinales) reported for the four States, Washington, Oregon, Idaho, and Montana, under the family and genus (arranged alphabetically) of the host on which they occur [cf. *R.A.M.*, xiii, p. 728]. A key for identification is provided when there are more than one rust under any host-genus. Some explanatory notes on the morphology of the Uredinales are given in the introduction, and indices of hosts and rusts are appended.

KARLING (J. S.). **A saprophytic species of Catenaria isolated from roots of Panicum variegatum.**—*Mycologia*, xxvi, 6, pp. 528–543, 2 pl., 3 figs., 1934.

A species of *Catenaria*, isolated from sterilized *Panicum variegatum* roots placed in a battery jar containing young growing *Eriocaulon septangulare* plants, has been successfully grown in a wide range of autoclaved vegetable and animal tissues, including nematodes, insects, algae, mosses, ferns, and angiosperms, amongst which dead onion roots proved the most favourable tissue for the development of the thallus. The fungus produces an abundance of predominantly uniciliate, occasionally bi- or triciliate zoospores of very variable dimensions, those with more than one cilium being thought to be possibly cases of imperfect cleavage. Two cases of fusion between uniciliate zoospores, however, were observed.

Attention is drawn to the close resemblance between the organism under observation and the liver fluke [*Fasciola hepatica*] parasite, *C. anguillulae* [*R.A.M.*, xii, p. 93].

VAN LUIJK (A.). **Pythium de Baryanum Hesse em. de Bary.**—*Meded. Phytopath. Lab. 'Willie Commelin Scholten'*, Baarn (Holland), xiii, pp. 23–28, 1934. [German.]

Exception is taken by the writer, in connexion with his studies on a fungus corresponding with de Bary's and Butler's descriptions of *Pythium de Baryanum* Hesse isolated from diseased grass roots in Holland and briefly described, to Drechsler's proposed transfer of many of the parasitic records of this species to *P. ultimum* Trow [*R.A.M.*, vi, p. 510].

Assuming that de Bary's emendations of Hesse's original diagnosis were justified—and this, in the writer's opinion, can scarcely be called in question—two courses are open. Either *P. de Baryanum* must be interpreted in de Bary's sense and the name *P. de Baryanum* Hesse emend. de Bary retained, or the species must be cancelled on the basis of incorrect diagnosis and probable absence of type material—an alternative to be adopted only in the last resort if hopeless confusion with old names is to be avoided. Drechsler's grounds for the retention of *P. ultimum* as a species distinct from *P. de Baryanum* are not considered to be free from objection; the writer is inclined to regard the differences as inadequate to warrant a separation. In all probability, *P. de Baryanum*, like many widespread fungi, is not a genetic unit. Neither parasitism nor the presence or absence of zoospores would appear to constitute sufficient grounds for specific separation in the case under discussion, and in view of the extreme variability of the antheridia of *P. de Baryanum*, the supposed differences between these organs are a very unreliable criterion.

MANIL (P.). **Note sur les nécroses foliaires du Tabac dans les cultures de la vallée de la Semois en 1934.** [A note on the leaf necroses of Tobacco grown in the Semois valley in 1934.]—*Bull. Inst. Agron. et des Stat. de Recherches de Gembloux*, iii, 4, pp. 367–377, 1934. [Flemish, German, and English summaries.]

In July, 1934, tobacco in the Semois valley, Belgium, showed a white

necrotic leaf spotting. On some plants of normal height the spots were usually 0·5 to 3 mm. in diameter, sparsely and uniformly scattered and most numerous on the lower leaves, while on others they were 0·5 to 8 mm. in diameter, circular, elongated in the direction of a vein or arranged in rings, and were chiefly present on the middle and upper leaves; many leaves were affected only in one place, generally near the tip or base on either side or both sides of the midrib. Occasionally, the leaves on one side only of a plant were affected. No chlorosis or mosaic was present on these plants. On others, below normal height, the spots resembled in position and shape those of the second type mentioned above; some of the upper leaves were unspotted but were chlorotic, asymmetrical, with the edges turned back towards the base, and the midrib contorted. The necroses that eventually appeared on these leaves occurred as brown lines or dots. All varieties grown were equally susceptible.

No fungus or bacterium was found in the affected material, and the evidence showed that the disease was not due to mineral deficiency. Serological examination by Gratia's method [*R.A.M.*, xiii, p. 542] demonstrated that it was not attributable to the X potato virus either alone or in association with others [ibid., xiv, p. 186]. On three occasions the virus of ordinary tobacco mosaic was isolated from the spots, but it was not possible to determine whether or not it was associated with any other virus. From the evidence obtained the author concludes that the condition is due to one or more specific viruses.

STANLEY (W. M.). **Chemical studies on the virus of Tobacco mosaic. II. The proteolytic action of pepsin.**—*Phytopath.*, xxiv, 11, pp. 1269–1289, 2 graphs, 1934.

A comprehensive, fully tabulated account is given of the writer's experiments on the proteolytic action of pepsin on tobacco mosaic (ordinary, masked, yellow, and aucuba strains), *Nicotiana glutinosa* and in some cases *Phaseolus vulgaris* being used as the test plants.

It was found that, in striking contrast to the results obtained with trypsin [*R.A.M.*, xiv, p. 199], pepsin at concentrations of 0·1, 1·0, or 10 mg. per c.c. of diluted purified virus produced no appreciable immediate effect on the infectivity of any of the strains at P_H 3 to 8. Even on prolonged digestion at 37° C. the action of pepsin on the viruses was negligible at P_H 7 and 8 and extremely slight at P_H 5 and 6; slow inactivation took place, however, at P_H 4, while at P_H 3 the process was rapid at 37° but no reduction of infectivity occurred at −15° even on protracted standing (up to 97 days). Pepsin-virus digestion mixtures, containing inactive virus, exert no appreciable immediate effect on the infectivity of virus added to such compounds, indicating that substances toxic to the virus or test plant are not formed as a consequence of the digestion of virus. Negative results followed attempts to restore the infectivity of pepsin-inactivated virus.

From the facts that pepsin inactivates virus only under conditions favouring proteolytic activity, and that the rate of such inactivation varies directly with the concentration of active pepsin, it is concluded that the inactivation of virus is due to the proteolytic action of pepsin. Hence it may further be deduced that the tobacco mosaic virus is either

a protein or some very closely related substance hydrolysable with pepsin [cf. ibid., xiii, p. 329].

PARK (M.). **Frog-eye or eye-spot disease of Tobacco.**—*Trop. Agriculturist*, lxxxiii, 5, pp. 322–324, 1 col. pl., 1934.

A brief, popular account is given of the frog-eye leaf spot disease of tobacco caused by *Cercospora nicotianae* [*R.A.M.*, xiii, p. 686], which is believed to be likely to affect considerably the prices obtained for cured tobacco produced in Ceylon, where tobacco of good quality and high grade is now being grown. Preventive and control measures are discussed in some detail.

AINSWORTH (G. C.), BERKELEY (G. H.), & CALDWELL (J.). **A comparison of English and Canadian Tomato virus diseases.**—*Ann. of Appl. Biol.*, xxi, 4, pp. 566–580, 2 pl., 1934.

The results [which are tabulated] of their comparative studies of virus diseases of the tomato show that the more common forms of these troubles occur both in England and in Canada. These are the ordinary or mild tomato mosaic caused by Johnson's tobacco virus No. 1 [*R.A.M.*, xiv, p. 197]; the 'aucuba' mosaic caused by Johnson's tobacco virus No. 6, which it is suggested should be called yellow mosaic of the tomato, since the former name has in the past led to some confusion with the aucuba mosaic of the potato; single-virus streak caused by a virus which is described for the first time in this paper under the name tomato streak virus No. 1, with an indication of its reactions on the tomato, tobacco, *Nicotiana glutinosa*, and *Datura stramonium*, and also of its properties; mixed-virus streak caused by a mixture of two or more viruses, this mixture usually consisting of a tobacco mosaic virus or tomato streak virus No. 1 and a potato virus of the X type [ibid., xiv, p. 185]; and spotted wilt. The mixed-virus streak appears to be more frequent in Canada than in England.

Brief accounts are also given of the other virus diseases which affect tomato in Canada, namely, stem-necrosis streak caused by Johnson's tobacco virus No. 9 and ring mosaic [ibid., x, p. 213], neither of which has as yet been recorded in England; a study was also made of the Irish Cobbler potato mosaic [ibid., ix, p. 401], which was found to be caused by a potato virus of the X type, and of Burnett's and Jones's 'latent' and 'virulent latent' potato viruses [ibid., xi, p. 595, and next abstract].

AINSWORTH (G. C.). **A comparison of certain English and Canadian Potato viruses found infecting Tomatoes.**—*Ann. of Appl. Biol.*, xxi, 4, pp. 581–587, 1 pl., 1934.

A brief account is given of the author's studies of the 'latent' and 'virulent latent' potato viruses [see preceding abstract], the first of which is believed to be possibly the same as J. Johnson's tobacco mottle virus [*R.A.M.*, v, p. 119], while the second appears from the literature to be the same as E. M. Johnson's healthy potato virus [ibid., x, p. 60], K. M. Smith's potato virus X, and J. Johnson's tobacco ring spot virus [ibid., vi, p. 501], which is quite distinct from Henderson's and Wingard's ring spot virus [ibid., xi, p. 132]. The two viruses studied were isolated from Canadian tomato material and were compared with authentic potato X

virus supplied by K. M. Smith, a strain of the same virus used at Cheshunt to produce mixed-streak virus, and the potato virus fraction of a mixed-virus tomato streak from Ireland. All these viruses were found to possess the same properties [which are briefly indicated], and when compared on tomato, tobacco, *Nicotiana glutinosa*, and *Datura stramonium* the symptoms caused by them on all the host plants varied from the somewhat virulent type characteristic of the X virus to the mild symptoms typical of the 'latent' virus, the difference between the two extreme types being very marked under all conditions. When mixed with tobacco virus No. 1 and inoculated into tomato each of the potato viruses produced typical streak, the symptoms being most severe when the most virulent potato virus was used, and least so with the mild 'latent' virus. These results, together with the fact that in a special series of experiments preliminary inoculation with the mild latent virus was found to protect the tomato plant against subsequent inoculation with the virulent latent virus [cf. ibid., xii, p. 583], are considered to indicate that all the viruses studied are of the potato X virus type, and it is suggested that they should be designated as the 'virulent X virus' and the 'latent X virus' respectively. It would seem advisable, however, that the latter should receive a special name, for the symptoms produced by it on certain plants are dissimilar to those caused by the virulent form which is identical with the type potato X virus.

CALDWELL (J.). **The control of virus diseases of the Tomato.**—*Journ. Min. Agric.*, xli, 8, pp. 743–749, 1934.

After a brief popular account of the chief virus diseases of the tomato in England, among which ordinary tomato mosaic, streak, and spotted wilt are stated to be the most common, and aucuba or yellow mosaic and 'double virus' streak are less commonly found [see preceding abstracts], the author states that the simplest way to prevent their introduction into glasshouses is the suppression of all weeds growing around the houses. After weeding operations care should be taken to wash the hands thoroughly with soap and water before touching any tomato plants in the houses; the same precaution should also be taken when handling diseased and healthy plants, since it has been definitely shown that most of the infection of the plants in the houses is caused by careless handling. Smoking tobacco, which it is now practically certain is a common source from which tomato plants become infected, should not be used in the houses, or, alternatively, it should be rendered innocuous by heating it to 100° C. for a minute or two. Routine fumigation for the control of insects should be carried on throughout the season, care being taken to clear out all corners and crannies where insects might hibernate.

CHAMBERLAIN (E. E.). **Narrow-leaf—a virus disease of Tomatoes.**—*New Zealand Journ. of Agric.*, xlix, 5, pp. 257–263, 5 figs., 1934.

A brief account is given of the author's preliminary investigation of an apparently hitherto undescribed disease of tomatoes which was first seen in 1933 in plants received from Gisborne and Hastings in New Zealand. During the summer of the same year the trouble became very prevalent in and about Gisborne, 50 per cent. of the crop being infected in two cases, and it recurred during the 1933–4 season in the Poverty

Bay and Hawke's Bay districts. In the field the plants may become infected at any stage of growth, but this frequently occurs between the setting of the first and second fruit trusses. The symptoms (which are very similar in the field and under glass) are first a distinct narrowing and a slight crinkling of the young leaves, becoming intensified as the plant grows until, in severe cases, there is much curling and distortion of the foliage. The disease does not affect the shape of leaves that are fully developed at the time of infection. The upward growth of infected plants is usually not greatly retarded, but the total leaf area is reduced, and the fruit is invariably smaller than normal, inclined to be flattened, and of light weight. Sometimes, however, growth is much retarded, and fruit fails to set on trusses formed after infection. Partial recovery with setting of fruit on the upper trusses was occasionally observed both in the field and under glass.

Inoculation experiments in 1933 showed that the disease is transmissible to healthy tomato plants (Sutton's Best of All) by rubbing the leaves with a muslin moistened with juice extracted from diseased plants (eighteen out of thirty-six inoculated plants), and by the aphid *Myzus pseudosolani* (two out of seven plants). It was also successfully inoculated into tobacco (five out of twelve plants); on this host the most characteristic symptoms were a stunting of the plant and a slight narrowing of the leaves, which were also of a slightly paler green than normal; the flowers, many of which failed to set fruit, were distorted and showed pink and white stripes. The disease was successfully returned from tobacco to tomato, on which the typical symptoms were reproduced.

Remedial measures are very briefly discussed.

PORTE (W. S.). **Notes on the control of transit and storage decays of Tomatoes by the use of chemical washes.**—*Phytopath.*, xxiv, 11, pp. 1304–1312, 1934.

The relative efficacy of a group of chemical washes in the inhibition of the tomato fruit rots caused by *Phoma destructiva* [*R.A.M.*, xiv, p. 182], *Rhizoctonia* [*Corticium*] *solani*, and *Phytophthora terrestris* [*P. parasitica*: ibid., xii, p. 121] was tested under carefully controlled conditions on commercial samples of 'green-wrap' Florida winter tomatoes in storage in 1929 and 1930. The average reduction of infection obtained by three minutes' immersion of the inoculated fruits in hot washes (115° to 122° F.) was 59·5 per cent. for the most effective mixture (1 per cent. borax in 1 to 300 commercial formaldehyde) and 29 per cent. for the least useful (1 per cent. borax and 1 per cent. potash alum). Rinsing the tomatoes in tap water immediately after treatment did not significantly augment the percentage of storage rots, except among the fruits washed in formaldehyde solutions containing other chemicals, in which there was an increase of 9·38 per cent. in the incidence of decay. Most of the *Phoma* infections developing on the stored fruits were natural rots imperceptible at the commencement of storage, and some of them proved resistant to the most effective washes used. No effect on the occurrence of the fruit rot was exercised by the ethylene gas used to accelerate the coloration of the tomatoes.

Tenth Annual Report of the Imperial Forestry Institute, University of Oxford, 1933–1934.—36 pp., 1934.

This report contains (pp. 19–21) the following items of phytopathological interest [cf. *R.A.M.*, xiii, p. 333]. The outcome of inoculations with *Dasyscypha calycina* [ibid., xiii, p. 482] and *Phomopsis pseudotsugae* [ibid., xiii, p. 483] on larch and Douglas fir [*Pseudotsuga taxifolia*], respectively, has so far been almost entirely negative, thus supporting the contention that frost is mainly responsible for the canker of the former and the die-back of the latter host [cf. ibid., xiii, p. 484].

The sixth annual survey of the Forestry Commission showed no significant increase in England of the Dutch elm disease (*Ceratostomella ulmi*) [ibid., xii, p. 334], which was further found to be absent from the part of Scotland inspected.

Phytophthora cambivora and *P. cinnamomi* [ibid., xiii, p. 784] have been isolated from sweet chestnut [*Castanea sativa*] suffering from ink disease in the south of England, and *P. cambivora* and *P. syringae* [ibid., xiii, p. 783] from beech affected by an analogous disorder of the root system. The disease is most virulent in the sweet chestnut and threatens its successful cultivation in the south of England. In both beech and chestnut a correlation appears to exist between liability to infection and soil constitution, the diseases being most prevalent on the more retentive and wetter types.

So far no satisfactory results have been obtained in the attempted isolation of a pathogen from the cankers on poplar (*Populus eugenii*) [ibid., xiii, p. 408]. This disease, or complex of disturbances as it may ultimately prove to be, is scattered throughout England and over a considerable part of Scotland, and may undoubtedly be regarded as one of the major silvicultural problems of the country.

Buisman (Christine J.). **The area of distribution of the Ceratostomella (Graphium) Elm disease.**—*Meded. Phytopath. Lab. 'Willie Commelin Scholten'*, Baarn (Holland), xiii, pp. 35–46, 1934.

Up to March, 1934, *Ceratostomella ulmi* had been found attacking elms in Holland, Belgium, France, Germany, England, Austria, Czecho-Slovakia, Switzerland, Italy, Rumania, Bulgaria, Portugal, Hungary, Jugo-Slavia, and the United States. A report as to its occurrence in Poland requires verification [*R.A.M.*, vii, p. 352].

Goidànich (A.) & Goidànich (G.). **Moria degli Olmi e Scolitidi.** [Elm die-back and Scolytids.]—*Italia Agric.*, lxxi, 10, pp. 941–948, 15 figs., 1934.

This paper on the part played in the dissemination of elm die-back (*Ceratostomella ulmi*) in Italy by the bark beetles *Scolytus sulcifrons* Rey and *S. multistriatus* and the control of these insects is a shorter version of one already noticed from another source [*R.A.M.*, xiv, p. 133].

Goidànich (G.). **La moria degli Aceri.** [The wilt of *Acer* spp.]—*Italia Agric.*, lxxi, 11, pp. 1043–1055, 15 figs., 1934.

Most of the items of information in this comprehensive but succinct review of a two years' study of the tracheoverticilliosis of *Acer campestre*,

A. platanoides, *A. pseudoplatanus*, and *A. negundo* caused in Italy by a *Verticillium* with dark microsclerotia have already been noticed from previous papers by the same author [*R.A.M.*, xii, p. 338; xiii, p. 811]. In harmony with Wollenweber [ibid., ix, p. 6] and others the author refers all the strains of *Verticillium* causing tracheomycosis to *V. albo-atrum*.

MASERA (E.). **Osservazioni sulla 'fersa' del Gelso.** [Observations on the Mulberry 'scourge'.]—*Ann. Tecn. Agrar.*, Rome, vi, 2, pp. 178–184, 1933. [Abs. in *Biol. Abstracts*, viii, 9, p. 2160, 1934.]

A conspicuous degree of resistance to *Phleospora mori* [cf. *R.A.M.*, viii, p. 339] in Italy was shown by the mulberry varieties Filippina, Florio, and Rosa Lombarda. Pruning was of real value in reducing infection owing to the overwintering of the fungus in the young parts of the branches. There must be other factors, as yet unknown, besides temperature, shade, and humidity, which influence the development and spread of the disease. Infected leaves appear to exercise a toxic action on silkworms.

SREENIVASAYA (M.) & RANGASWAMI (S.). **Field studies in the spike disease of Sandal (Santalum album Linn.). I. Observations on the natural dissemination of spike.**—*Proc. Indian Acad. Sci.*, i (*Mem. Indian Inst. Sci.* 26), pp. 143–154, 1934.

The discontinuity in the natural spread of sandal (*Santalum album*) spike [*R.A.M.*, xiv, p. 204] in Madras and its occurrence as isolated outbreaks in areas far removed from all apparent sources of infection may result from a possible transport of virus-infected seed or from long-distance dispersal of the insect vectors effected by wind or other agencies. The possibility of seed transmission of the disease has been experimentally indicated and is discussed in the light of recent studies. There is a frequent association of primary outbreaks of spike with existing or abandoned sites of cultivation and it is suggested that the trees are predisposed to the disease by the denudation of the forests for agricultural purposes.

The parallel spread of mosaics and leaf curls among the associated weed flora and that of spike in sandal is considered to be highly suggestive as indicating a favourable environment for the multiplication of viruliferous vectors. The insect vectors of spike disease were experimentally shown to be most active between April and June, with a secondary climax from October to December. Caging of the sandal plants has been found effectively to screen them from infection, none of those so treated (over 100) contracting spike during a period of 2½ years as compared with 13·4 per cent. infection among the uncaged controls. In another test 9·5 per cent. spike occurred among the uncaged and none in the caged plants.

Grafting experiments on large trees showed that even minute doses of infected tissues (80 to 100 mg.), introduced at a vulnerable point during the critical period for infection (April to June), are sufficient to induce spike.

Hahn (G. G.) & Ayers (T. T.). **Dasyscyphae on conifers in North America. III. Dasyscypha pini.**—*Mycologia*, xxvi, 6, pp. 479–501, 2 pl., 1934.

Continuing their studies on the species of *Dasyscypha* on conifers [*R.A.M.*, xiii, p. 553], the writers found that the large-spored, brown-excipled fungus causing a destructive canker of *Pinus strobus*, *P. monticola*, and *P. albicaulis* in North America, and of *P. sylvestris* in northern Scandinavia, is distinct from the saprophyte *D. fuscosanguinea* [ibid., viii, pp. 424, 745] with which it has hitherto been regarded as identical. The parasite, which appears to be restricted to northern latitudes and high elevations (3,000 to 6,000 ft.) on cold mountain slopes or Arctic pine barrens, is referred to Brunchorst's species *Lachnella pini* (1892) under the new combination *D. pini* (Brunch.) Hahn & Ayers, *D. monticola* Diehl being considered a synonym. The cultural characters of the fungus are described and morphological and physiological data presented in support of its separation from *D. fuscosanguinea*, which is only definitely known to occur in the Austrian Tyrol.

In North America *D. pini* was first collected in 1922, though it is believed to have been present for many years. It occurs on *P. albicaulis* in British Columbia, on *P. monticola* in British Columbia, Washington, and Montana, and on *P. strobus* in Michigan. The forms isolated from the three American pines were found to agree satisfactorily with the Swedish material collected on *P. sylvestris* in the Arctic region. On the latter host in Norway *D. pini* was associated with *Phacidium infestans* [ibid., xiii, p. 814].

Verrall (A. F.). **The resistance of saplings and certain seedlings of Pinus palustris to Septoria acicola.**—*Phytopath.*, xxiv, 11, pp. 1262–1264, 1934.

Observational and experimental evidence is adduced to show that one of the factors determining the resistance of some seedlings and most older plants of *Pinus palustris* to the brown spot needle blight fungus (*Septoria acicola*) in Louisiana [*R.A.M.*, xiii, p. 607] is the capacity of the host to produce resin, which impedes the advance of the fungus. The external sign of resin formation is a so-called 'bar-spot', i.e., a small area encircled by a yellow zone extending from under 1 to 3 mm. from the brown lesion. Such spots contain only a sparse amount of mycelium in the mesophyll layer, many of their cells are filled with resin, and only a few fructifications of the fungus are present. A similar phenomenon occurs in various other pines.

Lanphere (W. M.). **Enzymes of the rhizomorphs of Armillaria mellea.**—*Phytopath.*, xxiv, 11, pp. 1244–1249, 1934.

The enzymes extracted from the rhizomorphs of *Armillaria mellea* isolated from a well [*R.A.M.*, viii, p. 281] curbed with Douglas fir [*Pseudotsuga taxifolia*] at Seattle, Washington, were diastase, inulase, invertase, rennet, oxidase, peroxidase, and catalase.

Collins (J. F.). **Treatment and care of tree wounds.**—*U.S. Dept. of Agric. Farmers' Bull.* 1726, 38 pp., 14 figs., 11 diags., 1934.

This bulletin (a revision of No. 1178, entitled 'Tree Surgery', in the

same series) contains in a popular form much valuable information on neglected wounds, the structure and life processes of trees, causes of injury, and the various operations incidental to the prevention of damage and treatment of wounds. Laws regulating the commercial practice of tree surgery are stated to be in force in Connecticut and Rhode Island.

Miller (V. V.) & Meyer (Mlle E. I.). Влияние высущивания пораженной домовыми грибами древесины на их жизнеспособность. [Effect of desiccation of wood infected by house fungi on their viability.]—ex *Грибные повреждения древесины. Сборник работ Лаборатории Хранения Древесины ЦНИИМОД, I* [*Injuries to timber caused by fungi. Collection of the Works of the Laboratory for Timber Storage of ZNIIMOD, I*], pp. 5–22, Госуд. Лесное Техн. Издат. [State Forestal Tech. Publ. Office], Moscow, 1934.

The authors tested the viability at regular intervals up to 11½ months of the mycelium of *Coniophora cerebella* [*C. puteana*: *R.A.M.*, xiv, p. 69], *Merulius lacrymans*, and *Poria vaporaria* in pine wood blocks intermittently sterilized for three hours daily at 56° to 66° C. for three days and kept after inoculation under incubation for a month and a half, until they were fully permeated, when they were transferred to desiccators, in which the atmospheric humidity was maintained throughout at 77·2, 62·3, 49, 33·4, and 21·5 per cent., respectively. The results [which are tabulated] showed that the highest resistance to desiccation was exhibited by *P. vaporaria*, which was found to be still viable, although in a much weakened condition, after 212 days' sojourn in the atmospheres with 21·5, 33·4, and 49 per cent. humidity; at the end of the experiment it was still capable of producing rapid and vigorous new growth when removed from the atmosphere with 77·2 per cent. humidity, and of making some growth when removed from that with 62·3 per cent. *C. puteana* was found to be dead after 81 days at 21·5 and 33·4 per cent. humidity, after 94 days at 49 per cent., and after 343 days at 62·3 per cent., at which time, however, the cultures kept at 77·2 per cent. were still capable of giving rapid and vigorous new growth. The least resistant proved to be *M. lacrymans*, the viability of which was already considerably weakened after 54 days and entirely lost after 81 days at 21·5 per cent. humidity; it was dead after 152 days at 33·4, 212 days at 49 and 62·3, and 343 days at 77·2 per cent. humidity.

In a 60 cm. long piece cut from a wooden beam badly rotted by *M. lacrymans*, which was kept at room temperature in Moscow at humidities ranging from 30 to 45 per cent., the fungus was dead throughout the block after 5 months; in a 6 cm. thick board, also infected by *M. lacrymans*, the fungus died out in under 4½ months in a room in which humidity fluctuated between 40 and 50 per cent.

At 77·2 per cent. humidity *P. vaporaria* formed a very thin, hyaline covering on the pine blocks and continued its destructive action up to the end of the experiment, so that the blocks were reduced to a friable mass; at 62·3 per cent. no aerial mycelium formed, and the submerged hyphae gradually passed into a resting stage, the blocks remaining much firmer and losing considerably less weight than at 77·2; at the other three humidities tested the rotting process was soon stopped, and the

consistency of the blocks was hardly altered. *C. puteana* behaved in much the same way, but never formed an aerial mycelium. The rotting activity of *M. lacrymans* was very soon stopped at all the humidities tested, indicating the facility with which its mycelium passes into a resting stage under adverse conditions.

These investigations suggest that even large-sized infected timbers may be comparatively safely used for constructional purposes, provided that they have been dried out sufficiently to ensure the death of the organisms or are not subjected in the buildings to humidities above 65 to 70 per cent. In the latter case, the buildings should be examined at least twice a year by experts, since the resting mycelium may possibly revive and resume its destructive activity even after a long time, if conditions become favourable. The results are also discussed at some length in their bearing on certain other problems in the control of house fungi in infected premises.

Miller (V. V.) & Meyer (Mlle E. I.). Исследования по стойкости древесных пород в отношении гниения. [Investigations on the resistance to decay of various species of wood.]—ex *Грибные повреждения древесины. Сборник работ Лаборатории Хранения Древесины ЦНИИМОД, I* [*Injuries to timber caused by fungi. Collection of the Works of the Laboratory for Timber Storage of ZNIIMOD, I*], pp. 23–39, Госуд. Лесное Техн. Издат. [State Forestal Tech. Publ. Office], Moscow, 1934.

The experiments briefly described in this paper consisted in placing 1×2×2 cm. air-dry blocks of intermittently sterilized [see preceding abstract] wood of chestnut, oak, elm (*Ulmus campestris*), ash, beech, maple (*Acer platanoides*), Siberian larch [*Larix sibirica*], and birch on vigorously developing pure cultures of *Coniophora cerebella* [*C. puteana*] and *Merulius lacrymans* on sterilized hothouse soil in flasks kept in a dark, damp room at temperatures fluctuating between 16° and 21°, and determining the loss of dry weight caused by each fungus at the end of four months. The larch, maple, birch, and beech blocks were entirely covered by aerial mycelium very soon after the start of the experiments, the oak blocks being somewhat, and the chestnut and elm considerably less densely covered; elm wood, in particular, appeared to exert a repellent action on the mycelium, which extended over a part of its surface only late in the experiment. The results [which are tabulated] showed that the resistance to decay of oak was surpassed by that of chestnut (9 and 4·9 per cent. average dry weight loss, respectively), with elm a good third (14 per cent. loss). All the remaining species were badly rotted, the average dry weight losses ranging from 38·7 per cent. in ash to 64·1 per cent. in birch. In the less resistant species the loss in weight of the different blocks of the same wood was fairly consistent, with deviations from the mean not over 9·6 per cent., but the coefficient of variability in the more stable species was very high, up to 40 to 50 per cent., and even reached 67 and 92 per cent. in oak and elm, respectively, when rotted by *C. puteana*. The method used is evidently not too well adapted for testing the resistance of the more rot-resisting species of wood or of wood impregnated with preservatives, since the variability

in the results may be due to some factor or factors almost impossible to control even under the best experimental conditions, such as, for instance, the degree to which moisture is absorbed by the individual air-dry blocks from the culture substratum, a factor which, in all probability, considerably affects the concentration of the protective substance in certain areas of the blocks by leaching [cf. *R.A.M.*, xiv, p. 3].

In view of the surprisingly high loss in dry weight shown at the end of the experiment by the *L. sibirica* blocks, since this wood is usually considered in Russia to be fairly resistant to rot (unimpregnated railway sleepers of it lasting up to ten years and over), its resistance was again compared to that of birch and pine wood in an experiment, the duration of which was reduced to three months. This shorter time served to accentuate the differences in resistance to rotting of the three species, and showed that the larch wood was the most resistant, with pine coming next, and birch last, but not sufficiently so to recommend its use untreated under conditions conducive to infection with wood-rotting fungi.

Meyer (Mlle E. I.). Черные сучки и сердцевинная темнина Березы и влияние их на загнивание древесины. [Black knots and darkening of the heart wood in Birch in relationship to the initiation of timber rotting.]—ex *Грибные повреждения древесины. Сборник работ Лаборатории Хранения Древесины ЦНИИМОД, I* [*Injuries to timber caused by fungi. Collection of the Works of the Laboratory for Timber Storage of ZNIIMOD, I*], pp. 93–119, 18 figs., Госуд. Лесное Техн. Издат. [State Forestal Tech. Publ. Office], Moscow, 1934.

This is a detailed report of the author's investigation near Moscow in 1932 of a serious defect of birch wood, locally known as 'tcherny soutchok' [black knot]. The trouble is very frequently associated with a reddening or darkening of the heart wood and is particularly prevalent in marshy, waterlogged soils, where from 20 to 44 per cent. of the trees may be affected with it. The black, partially decayed knots, which easily fall out of the wood during its processing, were traced to broken-off snags of lateral shoots on the trunk which are later overgrown by healthy wood. They are produced only when the lateral shoot is broken off at a certain distance from the trunk, so that it is already dead and decaying from the action of saprophytic fungi when submerged by the overgrowth of annual wood. Very short snags, overgrown before they are entirely dead, even when already colonized by the same fungi, form hard, dark, horny knots which are organically joined with the surrounding wood and do not fall out when the wood is worked; these do not depreciate the value of the timber.

The decaying knots are almost invariably bounded by a zone of reddened or darkened wood, harder and tougher than the surrounding white wood; in most cases a similarly discoloured region develops in the centre of the affected trunks, very slowly increasing in diameter, and not delimited by the annual rings but rather sinuous in outline. No fungal mycelium was ever observed in the still hard or decayed portions of the knots, and all attempts to isolate an organism from these parts

gave negative results. Mycelium is, however, usually present in the darkened wood around the knots, and also in the central discoloured zone, sometimes extending into the apparently normal wood beyond, and isolations from these regions yielded 12 fungi, of which only *Stereum hirsutum*, *Coniophora cerebella* [*C. puteana*], and *Panus stipticus* could be identified in pure culture.

While the condition described above does not cause an active rot as long as the trees remain standing, decay soon sets in in logs cut from them, producing four different types of rot [which are described in some detail], namely, a marble-like rot associated with various species of fungi; a destructive rot caused by *C. puteana*; a light yellow rot caused by *S. hirsutum*: and a grey rot with darker areas, caused by *P. stipticus*. A theoretical explanation is given of the fact that the fungi do not cause active decay in the living trees but regain their rotting power after the death of the latter, and the paper terminates with a brief discussion of possible means of controlling the trouble.

Vakine (A. T.). К вопросу о предохранении бревен летней заготовки от грибных повреждений. [On the problem of the preservation of summer-felled logs from fungal injury.]—ex *Грибные повреждения древесины. Сборник работ Лаборатории Хранения Древесины ЦНИИМОД, I* [*Injuries to timber caused by fungi. Collections of of the Works of the Laboratory for Timber Storage of ZNIIMOD, I*], pp. 40–92, 13 figs., Госуд. Лесное Техн. Издат. [State Forestal Tech. Publ. Office], Moscow, 1934.

This is a detailed account of large-scale experiments in 1931 in the neighbourhood of Moscow to determine the conditions that are least conducive to the development of blue-staining and other lignicolous moulds, and of fungal rots, in summer-felled pine and fir logs stored *in situ*. Comprehensive notes are given on the more important fungi that were observed locally to cause blemishes and decay in the logs, the symptoms produced being briefly described. These are superficial blue staining caused by *Cladosporium herbarum* and *Alternaria humicola* on both hosts; deep-penetrating blue stains in both pine and fir caused by *Ceratostomella piceae*, *C. pini*, *C. coerulea*, *C. imperfecta* n.sp. [see next abstract], and *Hormonema dematioides* [*R.A.M.*, xiv, p. 68], and in pine alone by *Endoconidiophora coerulescens* [loc. cit.]; a reddish-brown (cacao-coloured) slow rot caused very commonly in fir but more rarely in pine by *Stereum sanguinolentum*; and a coffee-coloured one, more especially in pine, caused by a mycelium which has not yet been identified. Among the other fungi isolated special mention is made of a deep-seated, yellowish-pink or light orange discoloration in streaks, associated with fruiting bodies of *Corticium leve*, light-brown or whitish, frequently water-soaked discolorations caused by *Peniophora gigantea* [ibid., viii, p. 3], and a very slow, dirty grey, wet rot caused by *Schizophyllum commune*. A passing mention is finally made of very superficial yellow, delicate pink, cherry-coloured, and purple discolorations caused by moulds such as *Fusarium* and *Penicillium* spp., which, however, did not affect the properties of the timber and usually disappeared entirely as the wood dried.

While it is freely admitted that experiments during one season alone are not conclusive, the results of the main investigations indicated that effective protection against infection with these fungi, and also against too rapid desiccation leading to the formation of cracks in the timber and from attacks by bark-boring insects, was afforded by piling the unbarked pine and fir logs on low supports or directly on damp earth not later than 15 days after felling, into compact piles of 20 to 30 logs or more, and covering them with a thick layer of conifer branches; this should be supplemented by painting the cut ends of the logs with either 3 per cent. sodium fluoride or a 3 to 5 per cent. iron sulphate solution. Fir logs showed also little injury when they were stripped of the outer bark down to the bast, which should be left as uninjured as possible, and stored in loose piles, each row of logs being separated from the next by transverse supports.

MILLER (V. V.) & TCHERNTZOFF (I. A.). Новые виды грибков возбудителей синевы древесины. [New species of fungi causing blue stain of wood.]—ex *Грибные повреждения древесины. Сборник работ Лаборатории Хранения древесины ЦНИИМОД, I* [*Injuries to timber caused by fungi. Collection of the Works of the Laboratory for Timber Storage of ZNIIMOD, I*], pp. 120–128, 11 figs., Госуд. Лесное Техн. Издат. [State Forestal Tech. Publ. Office], Moscow, 1934.

A detailed account is given of the authors' [the junior of whom transliterates his name as Cernzow] morphological and cultural studies of three apparently hitherto undescribed species of *Ceratostomella* isolated from blue-stained timber in the U.S.S.R. *C. comata* n.sp. was isolated several times from pine logs near Moscow, on which it caused a grey stain of moderate intensity, with greenish-brown tinges. On beer wort agar the fungus produces a loose, white aerial mycelium tending to form small, vertical, coremial strands. Fructification sets in very early, at first by the production of conidia either on lateral branches of the strands or at the end of simple or more or less racemose hyphae. Typical *Graphium*-like coremia, up to 200 μ high, appear later, as the aerial mycelium becomes submerged in the substratum which takes on an intense brownish-black colour. The abundant, round to cylindrical conidia average 3 to 6·5 by 3 μ and accumulate at the top of the coremia in greenish-brown slimy droplets. Numerous perithecia were produced on sterilized wood. They are round to slightly elongated, 91 to 122 μ in diameter, with a beak 255 to 480 μ in length and 26 to 33 μ wide at the base, furnished at the tip with 14 to 24 cilia, 35 to 130 μ in length. The ascospores are kidney-shaped, and measure about 6 by 3·5 μ.

C. acoma n.sp. was also found exclusively on pine logs near Moscow, causing an intense bluish-black stain; it is considered to be locally one of the most active stainers of timber. On beer wort agar the fungus forms no aerial mycelium and grows slowly in the substratum, which eventually takes on a deep brown colour; at the end of two or three weeks, occasionally earlier, the submerged mycelium breaks up into numerous oidia, but no aerial fructification was seen. On wood the fungus produces within a week low, *Graphium*-like coremia, with a short,

cylindrical pedicel, frequently narrowing towards the base, which is occasionally of a faint brown colour. The conidia are cylindrical or obclavate, 2·5 to 5·7 by 2 to 3 μ in diameter, agglomerated at the top of the coremia in large white drops. Perithecia on wood are formed after three weeks; they are round, 200 to 250 μ in diameter, with a long (over 1 mm.), slender beak entirely devoid of cilia; the beak opens by simple dehiscence of its apical cells. The ascospores are cylindrical, and average 5·2 by 1·6 μ in diameter.

C. imperfecta n.sp. is an active stainer of pine and fir timber, and appears to be widespread in the U.S.S.R. On beer wort agar it forms a sparse, cottony, creeping aerial mycelium, at first pure white but in two to four days developing concentric greyish or brown rings; the substratum takes on a deep blackish-brown colour. The conidial fructification both on this medium and on wood is of the *Haplographium* type; the conidiophore (150 to 160 μ long) consists of a single, distinctly septate hypha which at its tip forms 2 or 3 rows of one-celled, closely adpressed, *Penicillium*-like branches, the end cells producing slender, hyaline sterigmata, from which the conidia are abstricted; the latter are white and slimy in mass, occasionally curved, and measure 5 to 13 by 3·2 to 5 μ. Perithecia are only formed on wood and are globular, 150 to 208 μ in diameter, with a stout beak measuring 312 to 520 by 39 to 45 μ and devoid of cilia. The oblong-oval ascospores are 5 to 5·5 by 2·6 to 2·8 μ in diameter. This fungus is considered to be related in its conidial stage to *H. bicolor* Grove. It causes an intense greyish-black discoloration of pine and fir wood, the parenchyma cells in the medullary rays of which are packed with its thick (up to over 10 μ in width) hyphae. The fungus frequently invades the tracheids chiefly of the spring wood; as in the other two species, the tracheids are penetrated exclusively through the bordered pits.

The paper terminates with German diagnoses of the three species described.

DUFRÉNOY (J.). **Le zinc et la croissance de la Vigne.** [Zinc and Vine growth.]—*La Potasse, 1934*, 75, pp. 137–139, 3 figs., 1934.

Very beneficial results in the development of vines (St. Emilion grafted on 1202 and Seibel hybrid 46–43) affected by court-noué in two localities in France were obtained by the application to the stocks in February of 500 gm. of zinc sulphate [cf. *R.A.M.*, xiv, p. 176] plus 500 gm. potassium sulphate.

Report on the work of the education and research division of the Ministry for the year 1932–1933. III. Horticulture.—*Journ. Min. Agric.*, xli, 9, pp. 863–891, 1934.

This paper summarizes the provisions of the Destructive Insects and Pests Order of 1933 and of the various orders issued during that year for the regulation of the growing or sale of plants affected with certain diseases in England and Wales as well as the importation of plants from abroad. It also contains an account of the practical application and working of these orders during the year under review.